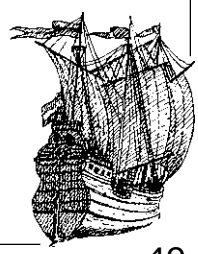
# A CLOSER LOOK

## SECTION 2
# THE NEWARK BAY COMPLEX, *RICH IN HISTORY*

Ancient geologic forces and climatic changes set the stage for the diverse topography and plethora of natural resources present in the Newark Bay Complex. Sediment deposition, volcanic upwelling, continental plate drifting, and glacial scouring created the foundation for many of the physical features we see today. The Hackensack Meadowlands is the remnant of Glacial Lake Hackensack. Snake Hill is part of an ancient volcanic neck, and the red sandstones and shales of the area were deposited in shallow seas during the Triassic Period in geologic history. Global climatic changes brought about alternating periods of freeze and thaw which created continental glaciers that covered the land and affected sea level. With the retreat of these glaciers, the sea level rose to near its current level, thus helping to create New Jersey's bays, estuaries, and tidal waterways.



Since humans first settled on the shores of the Newark Bay and its tributaries, they have altered and manipulated the area's habitats. Prior to European settlement, the Lenni Lenape Indians (Hackensack, Tappan and Raritan tribes) inhabited the Newark Bay Complex. The food, clothing, and shelter for this scattered and transitory population was derived directly from the natural resources of the land and water. These same natural resources provided for the early colonists in the 1600's and 1700's, but due to their non-transitory nature the pressure on these resources became more acute. Copper and basalt were mined; salt hay was harvested from the salt marsh, while cedar trees were harvested from the freshwater marsh; oysters were harvested from Raritan and Newark Bays; and, clay was extracted for making bricks and other buildings. With the drastic increase in population during the 1800 and 1900's, historical records tell how the quantities of certain natural resources were depleted and that the quality of drinking water became threatened, while sanitary systems and other human related services were strained. Impact on the environment became severe.

As expansion across the United States progressed, canals, railroads and road systems were built to link industrial and agricultural producers with distant customers. The upland areas of the Newark Bay Complex became the choice relocation site of people seeking to escape the problems of nearby cities - overcrowding, poverty, and pollution were all major concerns in the more urban areas. The marshlands between New York City and these upland areas were unsuitable for residential development and therefore became the repository for all kinds of refuse disposal (including human and animal waste), as well as by-products from early industrial manufacturing processes.

Currently, the Newark Bay Complex supports one of the most densely populated areas in the country. The area's land surface has been swallowed up by all the services that people need, including residential and industrial developments, transportation routes, stores and shopping malls, office complexes, sports complexes, parking lots, airports, refineries, and commercial and industrial sites. Every year, countless plans for development are proposed, reviewed, and accepted or denied. As a result, natural habitats and open space are limited and very valuable. Yet, visiting these open spaces gives the viewer a glimpse into the past. This urban estuary, once pristine and now highly impacted by human encroachment, continues to exude beauty, inspire artistry, and provide habitat for a myriad of animal species including fish, birds, and mammals.

The Newark Bay Complex is rich in both geologic and human history. Lessons in this section help the students learn about the way the land was formed, human use of natural resources, and land use strategies employed by people throughout time, from the Native Americans to today.

# WAY BACK IN TIME

## BACKGROUND INFORMATION

Read Figure 6A, "Geologic History of Northern New Jersey and the Newark Bay Complex."

### LEVEL

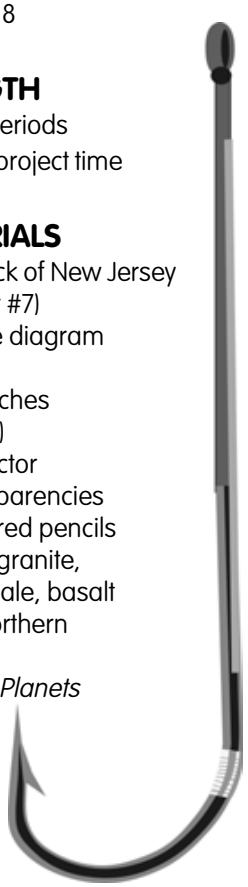
5 to 8

### LENGTH

4 class periods
Independent project time

### MATERIALS

- Geologic Bedrock of New Jersey (Discovery Sheet #7)
- Glacial Advance diagram (Figure 6B)
- Envisioning sketches (Figure 6C #1 - 4)
- Overhead projector
- Overhead transparencies
- Crayons or colored pencils
- Rock samples: granite, sandstone or shale, basalt
- Relief map of northern New Jersey
- Tape/CD of *The Planets* by Gustav Holst



### KEYWORDS

basalt
conglomerate
diabase
ecosystem
erosion
geology
glacial lake
glacier
granite
granite gneiss
landform
landscape
sandstone
sediment
shale
terminal
moraine
upland

### OVERVIEW

Major geologic events helped form the landscape in the Newark Bay Complex.

### OBJECTIVES

Students will:

- Describe how past geologic forces and events determined the present-day landscape;
- Practice reading maps to assist in their understanding of geological changes;
- Interpret geologic events to create a visual presentation;
- Explain how people use the natural systems formed from geologic forces.

### ADVISORY LINK

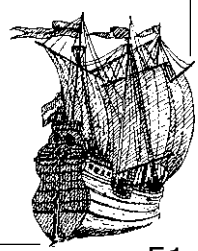
**The species listed in the Fish Consumption Advisories exist within a dynamic ecological system. To understand how and why the system functions requires knowledge of the area's geologic history. This knowledge leads to an understanding of how earth forces combined to create the interdependent ecosystems of the Newark Bay Complex.**

### STUDENT PREREQUISITES

Basic geologic terms and processes
Map reading skills

### PROCESS SKILLS

recalling, sequencing, communicating, analyzing, interpreting, synthesizing



## PLANNING

1. Make an overhead transparency of each of the following:
   - Newark Bay Complex map (Figure 5A), Geologic History of Northern New Jersey and the Newark Bay Complex (Discovery Sheet #7), Glacial Advance (Figure 6B), and each of the Envisioning Sketches (Figures 6C #1-4).
2. Copy Discovery Sheet #7 for each student.
3. Collect samples of granite, sandstone or shale, and basalt (See Resource section).

## PROCEDURE

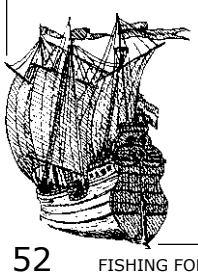
## SETTING THE STAGE

Think about how the surface of the earth looks. "What are some of the ways that the earth's surface can be changed to look differently than it does now"? Group these according to changes made by humans and those made by natural forces. [*Human – creating hills and depressions as in constructing a golf course or housing development, creating reservoirs, blasting mountains to create highways, putting soil and fill in low-lying areas; Natural – volcanic eruptions altering a mountain shape, floods changing river bed shapes, coastal storms removing/adding sand to the beach*] Discuss the time frame for most of these events.

## THE ACTION


**Period 1**

1. Tell the students that during these lessons they will be learning about how the surface of the earth in the northeastern part of New Jersey changed over a period of millions of years.
2. Distribute samples of granite (metamorphic rock from the Highlands), sandstone or shale (red/brown sedimentary rock from the lower-lying areas of Bergen, Passaic, Essex, Union, Hudson and Middlesex counties, used as the building material for "brownstones"), and basalt (gray igneous rock from the Watchung Mountains, also called trap rock and often used as crushed gravel in driveways).
3. Have the students study the samples and discuss the differences that they see between the three rock types.
4. Distribute the Geologic Bedrock of Northeastern New Jersey map (Discovery Sheet #7) to each student. Instruct the students to locate the area where each of the rock samples may have come from, and then color-code the map and key.
5. Ask the students to list the other types of rocks that are shown on the map. Explain what a conglomerate is and what diabase is.
6. Ask the students to cross-reference the geologic map to a relief map to discover the names of some of the landforms the different rocks created. [*Diabase – the Palisades, basalt – the Watchung Mountains, granite – the Highlands, more specifically, the Ramapo Mountains sandstone/shale – valleys, conglomerate – Hamburg Mountain, Wawayanda Mountain, Green Pond Mountain*]



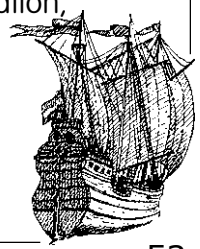
7. Display the Newark Bay Complex map (Figure 5A) on an overhead projector. Have the students locate where their town would be located on this map.
8. Overlay a transparency of the Geologic Bedrock map (Discovery Sheet #7) to help students determine the general geology of where they live.

**Period 2**

1. Now that the class knows there are differences between the rocks and the types of landforms that these rocks created, read "Geologic History of Northern New Jersey and the Newark Bay Complex" to the class. (Figure 6A)
2. After the reading, ask the students, "According to the description, what forces helped create the landforms that we see today"? [*mountain building, volcanic activity, glacial activity, erosion, the sea covering the land*]
3. Have the students work in small groups to recall the major events and write them down in sequence.
4. Use the students' recollections to create a simplified listing of the events that reflect the following key points:
   a. The Highlands are formed.
   b. Seas deposited red shales and sandstones over low-lying areas.
   c. Magma oozed from within the earth onto the surface and hardened into rock over time.
   d. The surface of the earth lifted and eroded numerous times. This action created ridges of hard resistant rock (the Watchung Mountains and the Palisades) and valleys of softer rock (the Piedmont).
   e. Streams and rivers helped carve the landscape.
   f. A glacier that covered the land carried boulders and gravel from the mountains. As the glacier melted, the boulders were left behind. This created a long line of rocks that blocked the glacier's melt water from exiting to the sea.
   g. Large lakes formed behind the boulder ridges.
   h. When the glacier retreated, the land lifted and tilted slightly toward the sea. This allowed the large lakes to slowly drain and produce the landscape we see today.
5. Overlay the Glacial Activity map (Figure 6B) on top of the Newark Bay Complex map (Figure 5A) to show the students the extent of the glaciers. Discuss how the land where their town exists was affected by glacial activity [*glacier was directly on top of the land; boulders, rocks, pebbles, and silt were deposited by the glacier on the land*].
6. Show the Envisioning Sketches to the class (Figures 6C #1-4). Discuss each interpretation.

**Period 3**

1. Divide the students into small groups or pairs. Tell them that, like the artist who created the envisioning sketches, their challenge is to interpret the geologic history of the area and create a way of sharing this information and action with the rest of the class. Discuss examples of various strategies they could use: model building, dramatization, computer images or simulations, video, dance, poetry, etc.
2. Provide the students with either the guided imagery story or the geologic event listing for reference.
3. Establish a time limit for each presentation. Discuss the points that will be used in the presentations' evaluations including: originality, clarity, completeness, organization, correct sequence of events, time, etc.
4. Work with each group during this period to keep the project and presentation on task and focused.



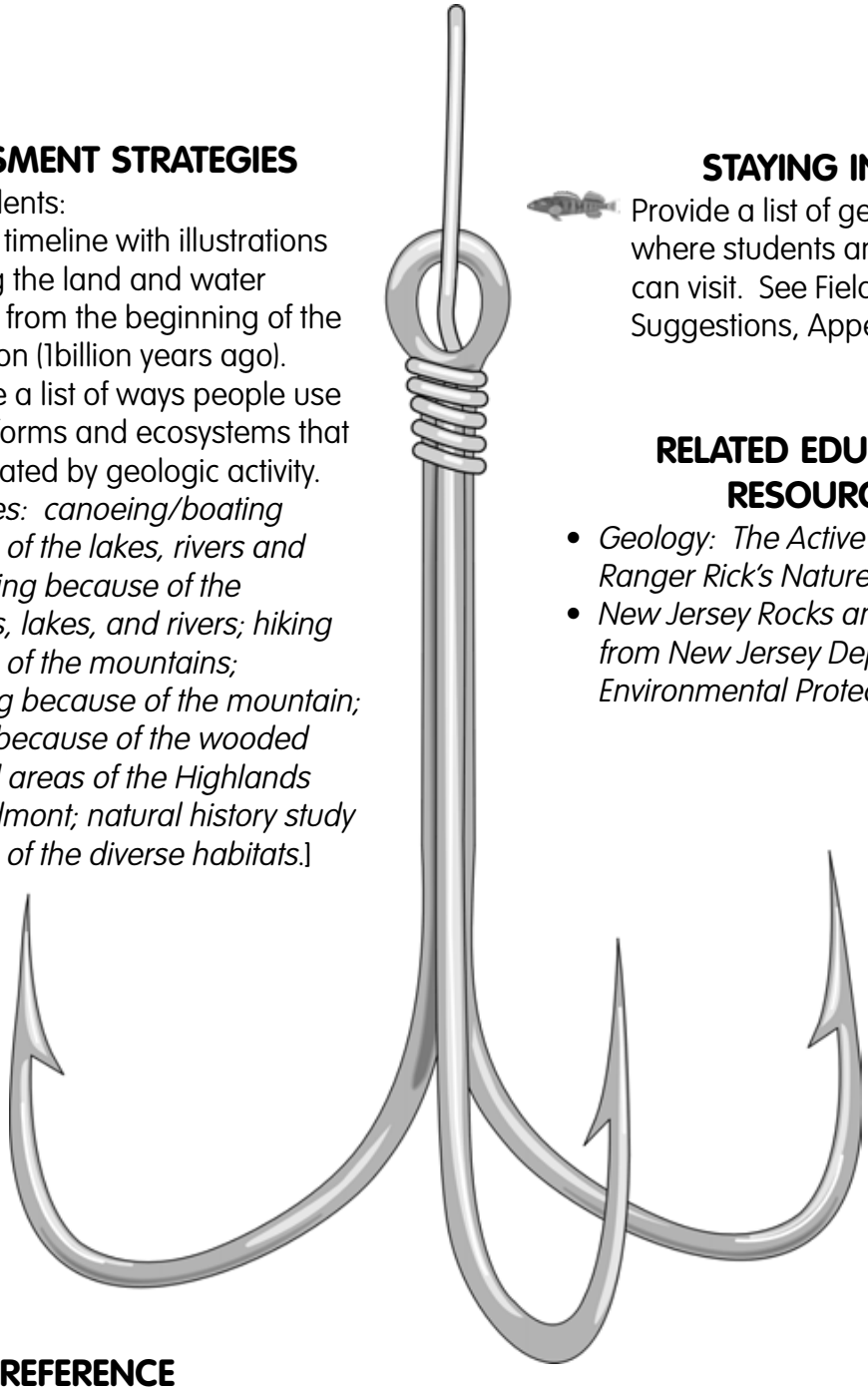
**Period 4**

Have the student groups share their interpretation of the geologic history of northeastern New Jersey.

## ASSESSMENT STRATEGIES

Have the students:

- ❑ Create a timeline with illustrations depicting the land and water changes from the beginning of the description (1billion years ago).
- ❑ Generate a list of ways people use the landforms and ecosystems that were created by geologic activity. [*Examples: canoeing/boating because of the lakes, rivers and bay; fishing because of the estuaries, lakes, and rivers; hiking because of the mountains; quarrying because of the mountain; hunting because of the wooded and field areas of the Highlands and Piedmont; natural history study because of the diverse habitats.*]



## STAYING INVOLVED

Provide a list of geologic sites where students and their families can visit. See Field Trip Suggestions, Appendix C.

## RELATED EDUCATION RESOURCES

- *Geology: The Active Earth from Ranger Rick's Nature Scope.*
- *New Jersey Rocks and Sediments kit from New Jersey Department of Environmental Protection*

## REFERENCE


Collins, Beryl Robichaud and Karl H. Anderson. *Plant Communities of New Jersey.* Rutgers University Press, New Brunswick, NJ. 1994.

Mitchell, Alison E. *The New Jersey Highlands: Treasures at Risk.* New Jersey Conservation Foundation, Morristown, NJ. 1992.

Quinn, John R. *Fields of Sun and Grass: An Artist's Journal of the New Jersey Meadowlands.* Rutgers University Press, New Brunswick, NJ. 1997.

Wright, Kevin. *The Hackensack Meadowlands.* An unpublished report for Hackensack Meadowlands Development Corporation Environment Center.

Geologic Map of New Jersey

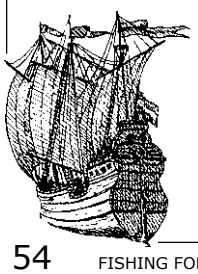



Figure 6A

# GEOLOGIC HISTORY OF NORTHERN NEW JERSEY AND THE NEWARK BAY COMPLEX - GUIDED IMAGERY

(Play *The Planets* by Gustav Holst)

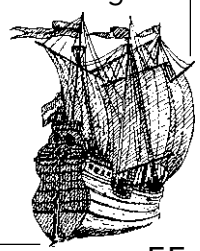
We need to go back very far in time, so close your eyes, put your head down, and listen. Let the music carry you back to a time before cities, before bridges, before ships, before people, and even before the dinosaurs. I want you to see a written number. It is the number 1 followed by a comma...zero...zero...zero...comma...zero...zero...zero...comma...zero... zero...zero. We have now gone back in time 1 billion years.

You have entered a time in the Earth's history called the Precambrian Era when some of the oldest rocks of New Jersey were formed. A large shallow inland sea covered the entire area and layers of sand, silt, and clay settled to its bottom. Over time, heat and pressure from the earth's forces changed these sediments into rocks that formed mountains as tall as the Alps. Today we call these mountains "the Highlands."

Millions of years passed like the slow turning of pages – each telling a new story. The sea covered the low elevations of New Jersey many times. Each time the sea withdrew; it left behind sand, silt, and mud. Mountain streams flowed out of the Highlands washing soil and rocks down to lower-lying areas. Over many years, new rocks such as conglomerates were formed from these materials. As earth forces lifted the land again, new mountain ranges were built from these rocks.

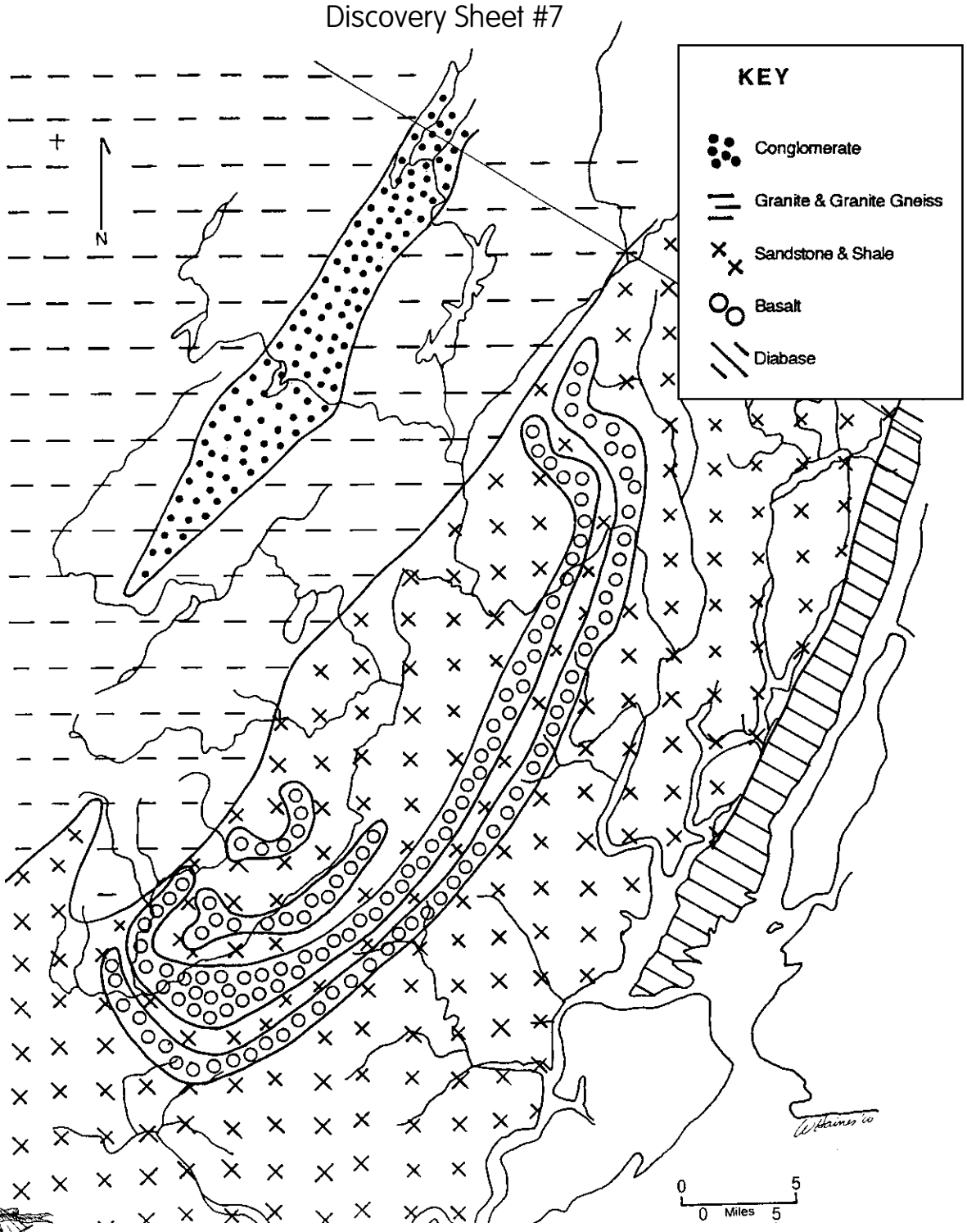
Time marches forward and we enter the Mesozoic era, when large three-toed dinosaurs roamed the land area of New Jersey. Swamps and lakes, mud flats and sandy shores covered New Jersey in the region we now call the "Piedmont." This broad band of land covers the middle of our state from the Hudson River to the Delaware River. Red-colored sediments settled to the bottom of another shallow sea and these eventually hardened into rocks called sandstones and shales. From under the surface of the earth, magma oozed through the softer sandstones and shales and it too slowly hardened to rock. Over the years, the softer sandstones and shales eroded and the harder rock made from magma was exposed to make the ridges we now call the Watchung Mountains and the Palisades.

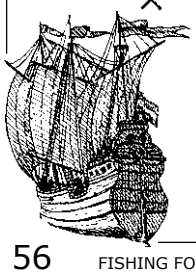
The land continued to be lifted to form mountains and continued to be eroded by rain and mountain streams. Glaciers covered Northern New Jersey several times. At times, the glaciers were one-mile thick and so heavy that the land underneath sank as much as 2,000 feet from its current elevation. Four glaciers affected the landscape of New Jersey and the most recent one melted about 12,000 years ago. Its ice sheet extended south as far as north central New Jersey. As it moved across the northern mountains, the glacier slowly plucked, gouged, scoured and moved rocks. As the ice melted, the large boulders that rode on top of the ice flow dropped to the land in a line of scattered rocks called a terminal moraine. These walls of rock blocked the flow of streams and created huge lakes. As the glacier continued to melt, the fine sediments in its meltwater were deposited on the bottom of the lakes. These sediments formed thick beds of clay. Eventually the great weight of the glacier lessened and the land lifted. The entire northeastern part of New Jersey tilted slightly toward the sea and these great lakes were able to slowly drain. Our landscape today is a result of these historic geologic activities.



# GEOLOGIC BEDROCK OF NORTHEASTERN NEW JERSEY

Discovery Sheet #7



(Copied from one prepared by J.C. F. Tedrow [1962]. The source of the map key also was from Tedrow 1962, with 1993 written comments, and additional data was extracted from the official geologic map of New Jersey prepared by J.V. Lewis and H. B. Kummel in 1910-12 and revised by Kummel and others.)

# GLACIAL ADVANCE

Figure 6B

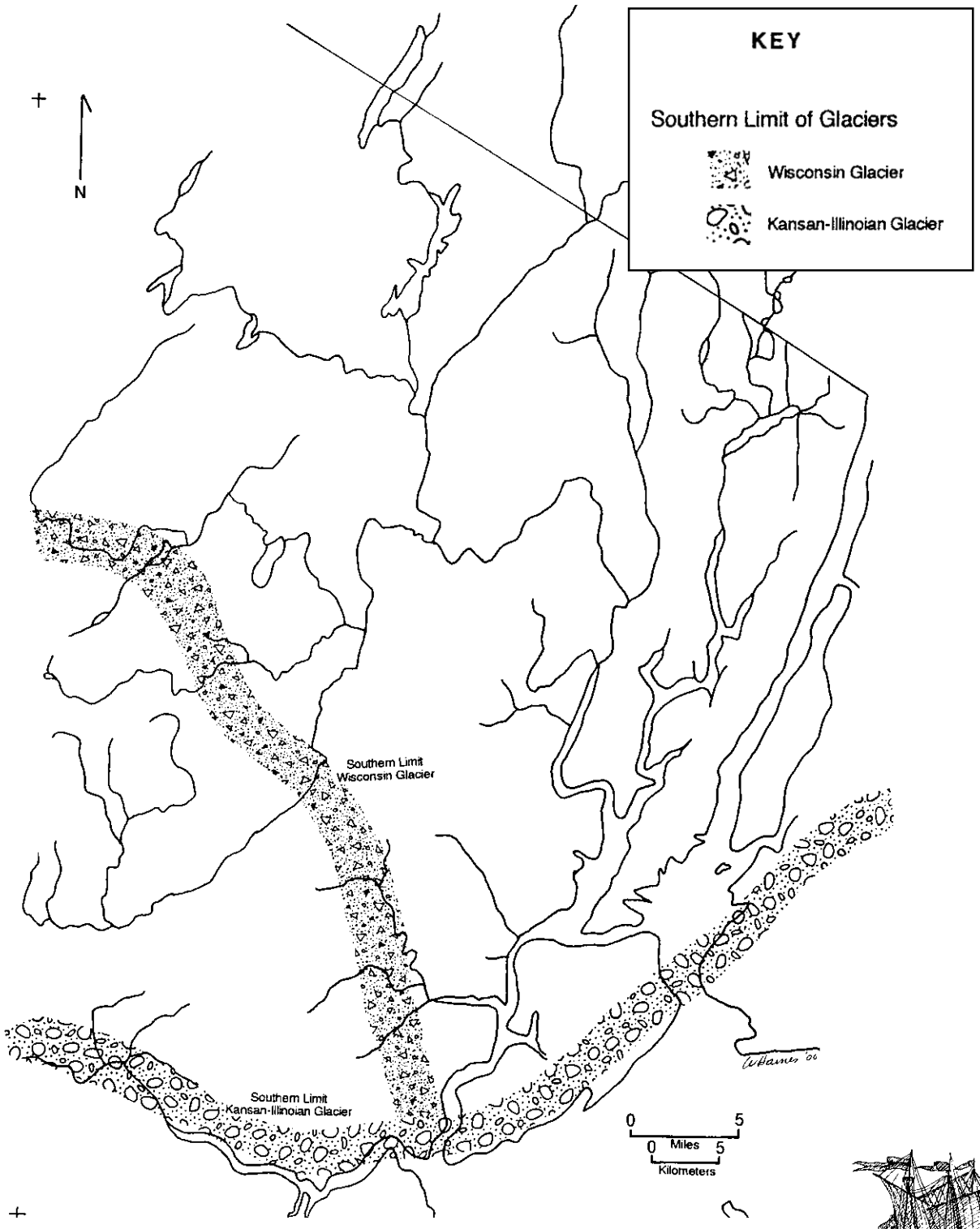



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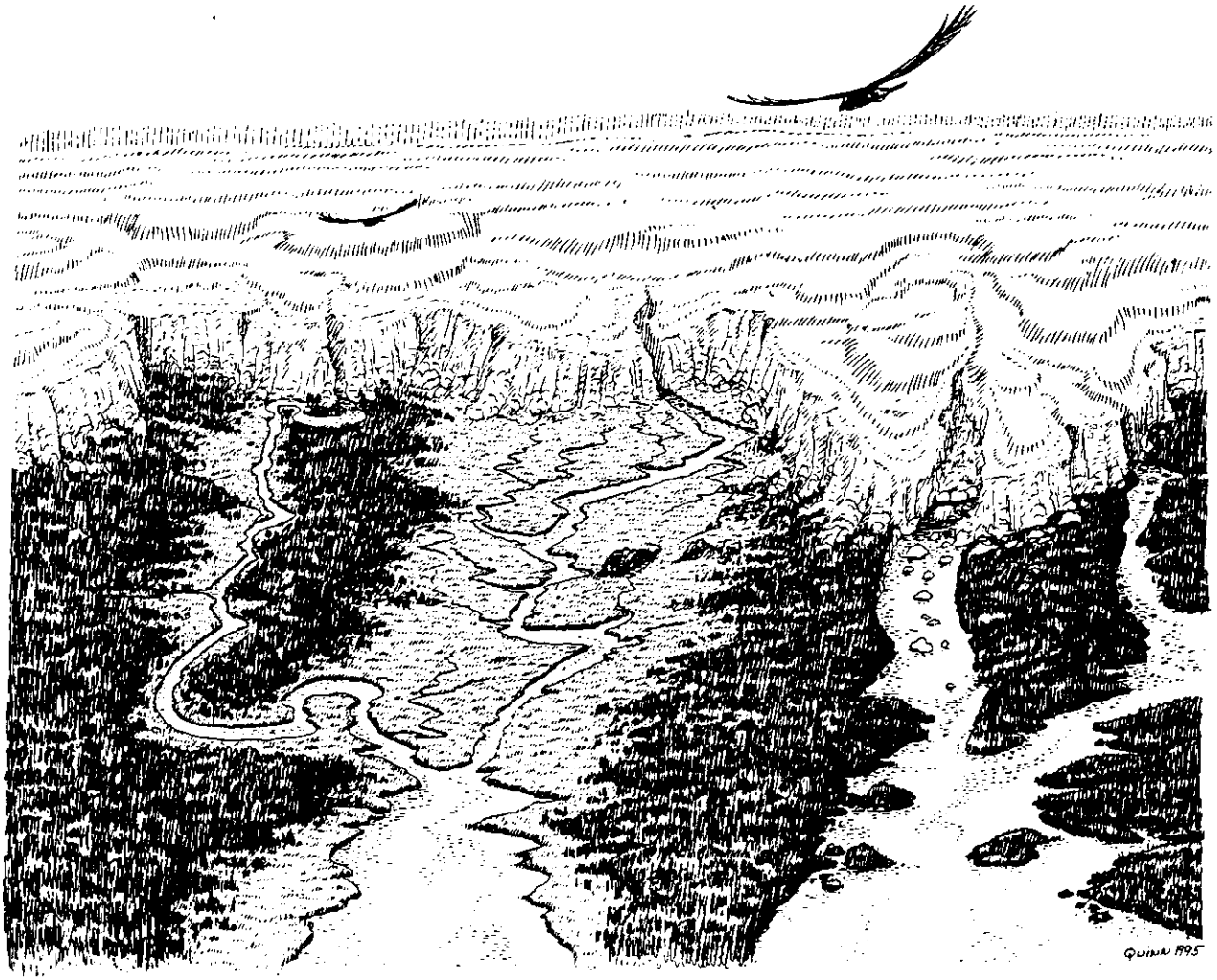
Figure 6C (Sketch 1)

# ENVISIONING SKETCH - The Advance of the Glacier



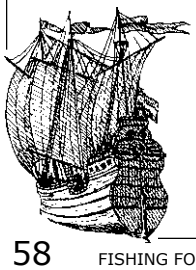



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Figure 6C (Sketch 2)

# ENVISIONING SKETCH - The Melting of the Glaciers and Formation of Glacial Lakes


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Figure 6C (Sketch 3)

# ENVISIONING SKETCH - The Draining of the Glacial Lakes

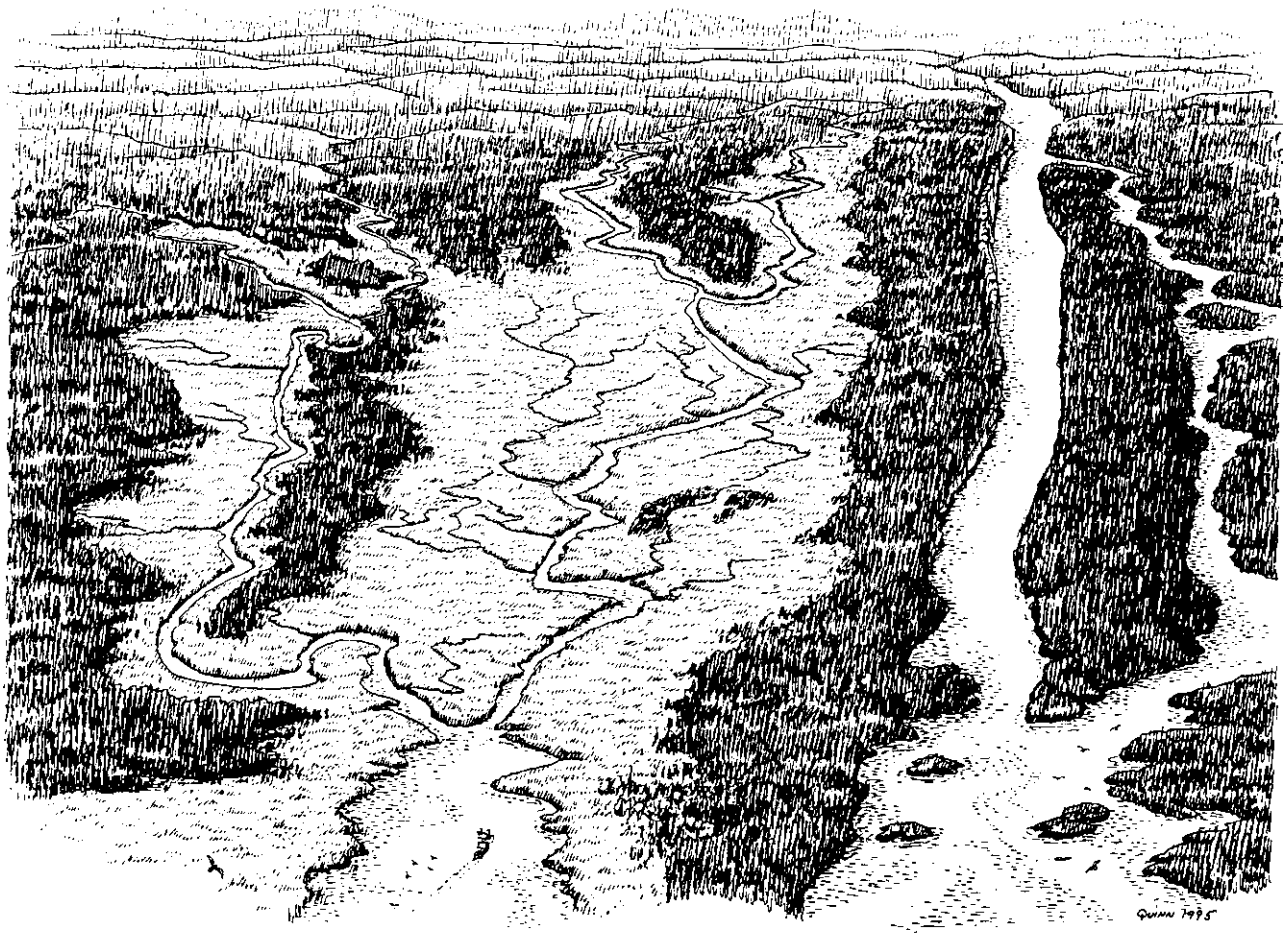

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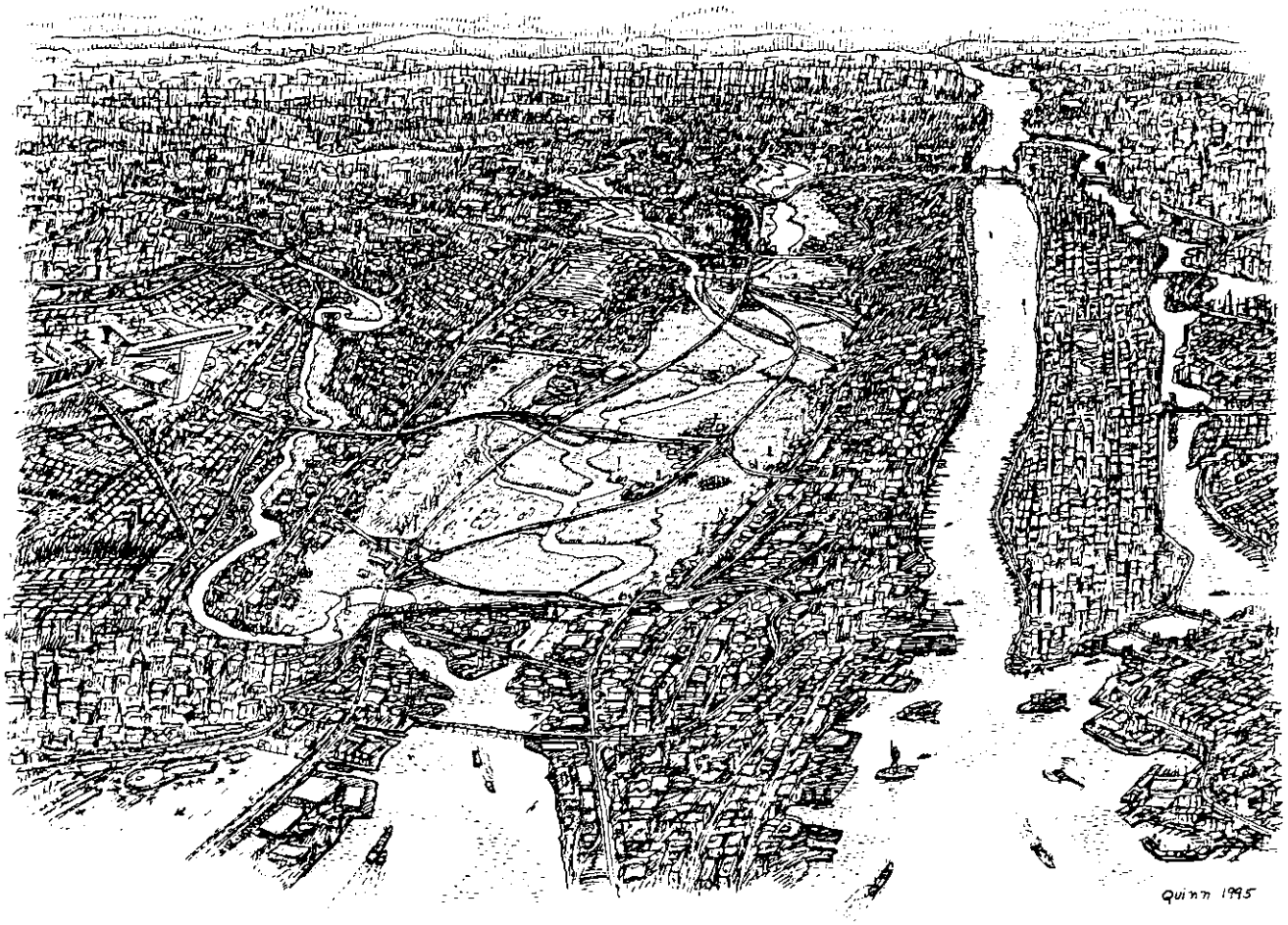
Figure 6C (Sketch 4)

# ENVISIONING SKETCH - The Area as it Looks Today

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# POPULAR PERCEPTIONS

## BACKGROUND INFORMATION

Interpreting historical information has always provided a window to an earlier time. Information comes in a multitude of forms. Geologists interpret rock strata to help understand how the land was formed; while paleontologists study how plant and animal species evolved over time. Anthropologists interpret cultural or societal artifacts to piece together how past societies lived. Historians interpret text from newspapers, books, journals and maps to provide a clearer picture of the evolution of a family, community, business, town or region.

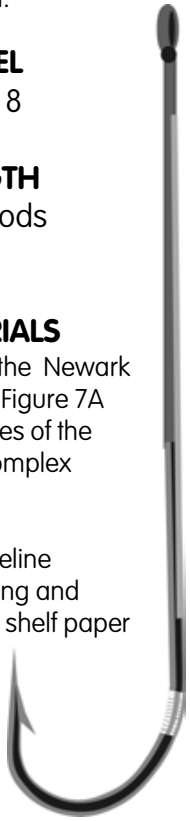
Reading and interpreting actual writings from various time periods can encapsulate the human history of the Newark Bay Complex. These writers reflect personal views, professional views, and business ventures. By compiling these, an historian is able to hypothesize what it was like to live during a specific historical period.

**LEVEL**
6 to 8

**LENGTH**
2 periods

### MATERIALS

- Perceptions of the Newark Bay Complex - Figure 7A
- assorted pictures of the Newark Bay Complex
- poster board
- glue or staples
- paper for a timeline (at least 15 ft. long and 2 ft. wide), e.g. shelf paper
- markers



### KEYWORDS

perception
perspective

### OVERVIEW

Students gain an historical perspective on peoples' changing views of the Newark Bay Complex area.

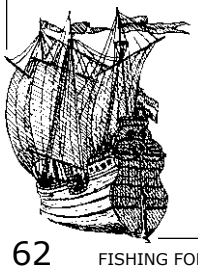
### OBJECTIVES

Students will:

- Interpret historical information and summarize how the natural systems of the Newark Bay Complex were viewed during different time periods;
- Describe changes that have occurred to the natural systems of the Newark Bay Complex;
- Explain how people's perceptions affect land use and the environment.

### ADVISORY LINK

**Many of today's environmental issues are so complex that it is extremely difficult to sort through facts to decide the appropriate actions for specific issues. The Fish Consumption Advisories were developed to warn anglers of potentially harmful substances that can be found in specific species of fish and crabs. Social mores, cultural heritage, custom, socio-economic status, and religious affiliation are just a few of the factors that will determine how an individual angler reacts to the Advisory guidelines.**



### STUDENT PREREQUISITES

Some knowledge of the natural and built components of the Newark Bay Complex

### PROCESS SKILLS

analyzing
describing
evaluating
formulating hypotheses
interpreting information
sequencing
summarizing
synthesizing

## PLANNING

1. Collect pictures of sights from the Newark Bay Complex (Examples: the New Jersey Turnpike, Newark Airport, Meadowlands Environment Center, Meadowlands Sports Complex, landfills, marshes, animals, cars, trucks, and ships). Make a collage with all the pictures.
2. Make one copy of Figure 7A. Cut quotations into separate pieces.
3. Cut a 15-foot length of paper for making the timeline. Mark the paper to show the following time periods: 1600's, 1700's 1800's, 1900's, current year, the future.

## PROCEDURE

## SETTING THE STAGE

Show the students the collage of pictures from the Newark Bay Complex. Ask the students to write down a few sentences that describe their perception of the Newark Bay Complex based on what they know already or what they see in the pictures. Put these comments aside to use in the timeline.

## THE ACTION


**Period 1**

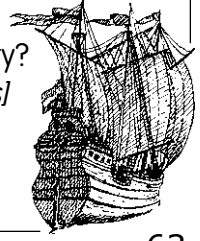
1. Mix the separate quotation sheets so they are not in order. Distribute one quotation to each student. Explain that each excerpt describes what some people thought of the Newark Bay Complex area during a different period in time.
2. Have the students arrange themselves in time order starting with the 1600's. Ask each student to read aloud his/her quote.
3. Create time period groups (1600's, 1700's, 1800's, 1900's). Ask each group to write a brief summary about how some people viewed the area of the Newark Bay Complex during that time period.

**Period 2**

1. As each group reports on the prevailing attitude of the time period, affix their summary to the appropriate place on the paper timeline. Create a "timeline of perceptions."
2. Add the students' current views (from "Setting the Stage") to the current opinion's spot on the timeline.
3. Ask the students to write about how they would like to see environments of the Newark Bay Complex in the future. Add these to the timeline.

## CLOSING DISCUSSION

1. How did peoples' attitudes change toward the Newark Bay Complex ecosystem over time? How did peoples' attitudes remain the same toward the Newark Bay Complex?
2. What methods were used to inform or influence people's attitudes during the time periods that we studied? [*newspaper articles, real estate advertisements, letters, interviews, experts*] What additional methods are used in today's society? [*television, computer, reports, books, magazines, events, music, public forums]*
3. What strategies could you use now for changing people's perception toward the area?



## ASSESSMENT STRATEGIES

Have the students:

- ❑ Select a community member from the Newark Bay Complex (real estate salesperson, boat captain, developer, bird watcher, etc.) and write a persuasive article about the Newark Bay Complex from that person's point of view. Establish and use criteria for evaluating written products. Have part of the criteria reflect whether the persuasive technique was effective.

## EXTENSIONS

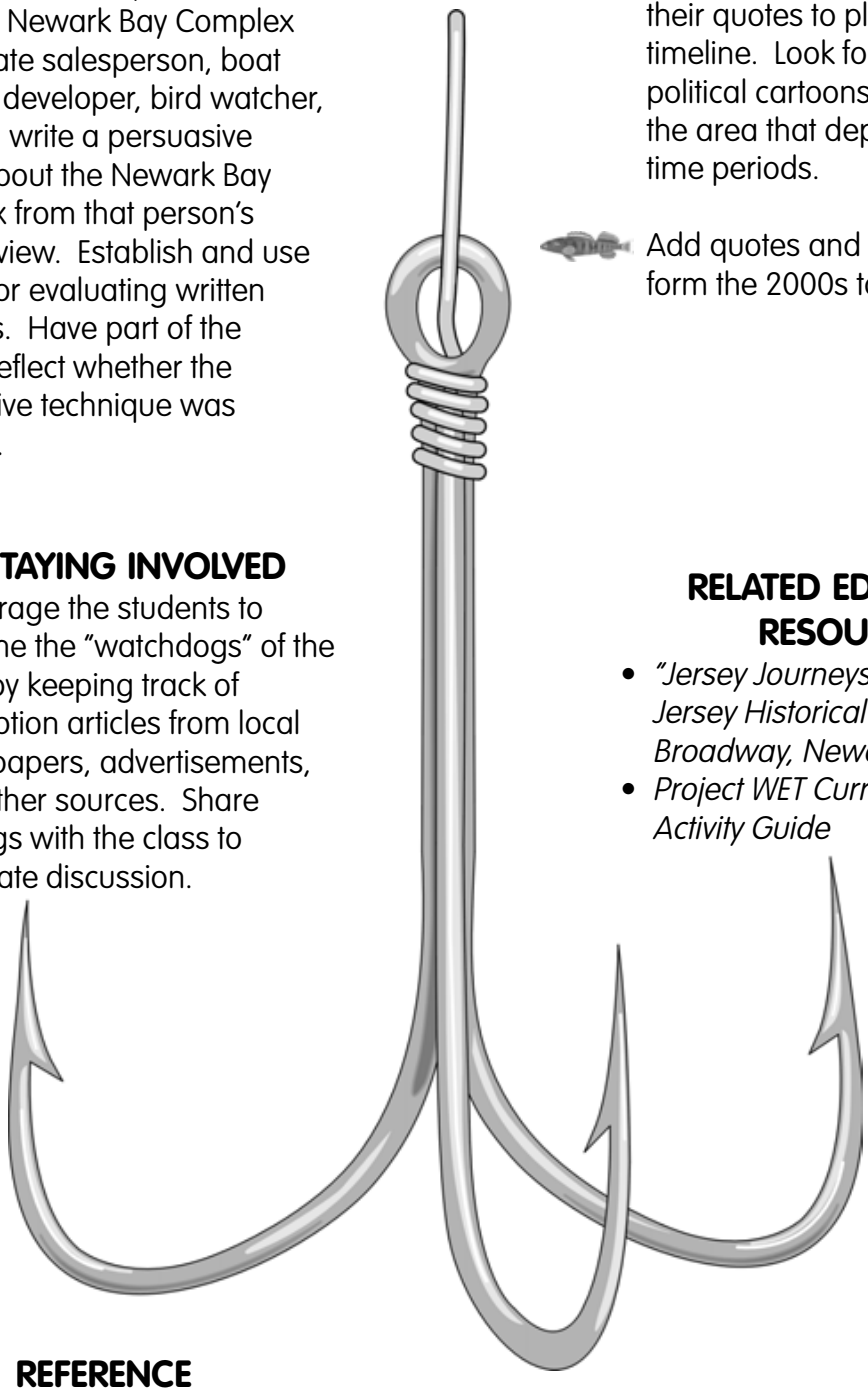
- Draw pictures, cartoons, etc. of their quotes to place on the timeline. Look for historical / political cartoons and satire from the area that depict the different time periods.
- Add quotes and perceptions form the 2000s to the timeline.

## STAYING INVOLVED

- Encourage the students to become the "watchdogs" of the area by keeping track of perception articles from local newspapers, advertisements, and other sources. Share findings with the class to stimulate discussion.

## RELATED EDUCATION RESOURCES

- *"Jersey Journeys" by the New Jersey Historical Society, 230 Broadway, Newark, NJ 07104.*
- *Project WET Curriculum and Activity Guide*



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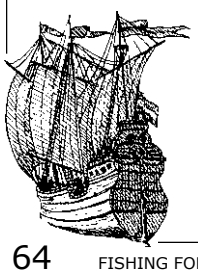


Figure 7A

# PERCEPTIONS OF THE NEWARK BAY COMPLEX

## 1609

"There they found a river (the Kill von Kull) to the westward, between two islands, the lands... were as pleasant with grass and flowers, and goodly trees as ever they had seen, and very sweet smells came from them...So they went in about two leagues and saw an open sea (Newark Bay)."

*Early Dutch and Swedish Settlers of New Jersey, Lieby, p.4, 1964*

## 1628

"At the side of the ...little river, which we call Achter Col, there is a great deal of reedy land; the rest is full of trees, and in some places there is good soil, where the savages plant their maize, upon which they live, as well as by hunting."

*Letter of Issac DeRasieres to Samuel Blommaert, Narratives of New Netherland 1609-1664, Jameson, J. Franklin (ed.), New York: Barnes & Noble, Inc., 1958.*

## Early 1600's

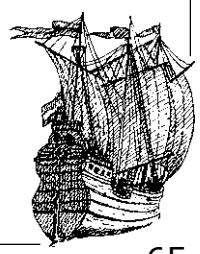
"Numerous species of waterfowl were considered 'very good and fit to eat' including swans, geese, various ducks and divers. Salt water fish harvested from local waters included codfish, weak-fish, herring, mackerel, flounders, sharks, and others 'unfamiliar to European eyes.' From the sandy and muddy bottoms came lobsters, crabs, conchs, abundant oysters and mussels, land and sea tortoises. Along the margins of the marsh and tidal creeks, there were wild turkey, plover, wood and water snipes, pheasants, heath-hens, cranes, herons, and bitterns. On the islands in the marsh or within the enclosing forests and uplands roamed mountain lions, bears, elk, deer, wolves, beavers, otters, fishers, and many other animals."

*Descriptions from the early Dutch observers taken from The Hackensack Meadowlands by Kevin Wright, p. 9.*

## 1719

"New Jersey passed a conservation law that applied to all (except Lenape Indians), 'No gathering of oysters from the [New Jersey] half of the Great Beds [Raritan Bay] should take place between May tenth and September first and none of its oysters should be taken by any vessel not owned within New Jersey."

*The Fisheries of Raritan Bay by Clyde MacKenzie, Jr.*



## 1750

"The Indians who inhabited the coast before the arrival of the Europeans made oysters and other shellfish their chief food, and at present whenever they come to salt water where oysters are to be gotten, they are very active in catching them, and in selling them in great quantities to other Indians who live further inland."

*From Peter Kalm's Travels in North America. The English Version of 1770, Vol. II. Wilson-Erickson, Inc., NY 1937.*

## Circa 1768

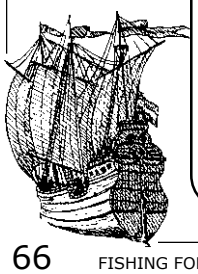
"The meadows are reckoned by those in the neighborhood, who have frequently mowed in them, not inferior to any salt meadow in that part of the country; and some parts thereof at a very small expense, may be made fresh meadow, and to yield good English grass. The timber and wood of every kind in the cedar swamp, is in great perfection as the present owner has preserved it, and prevented any wood being cut out for near upon 30 years. The conveniences of landings and easy carriage from the said cedar swamp are in no way inferior to those of any other swamp on that neck; as a great part of the swamp is bounded by Berry's Creek, and common sloops and wood-boats go up the creek to be loaded; and from the other side of the tract the timber may be brought to Hackensack River, by sledding or carting it one quarter of a mile..."

*Advertisement from NJA Vol. XXXVI, Newspaper Extracts Vol. VII 1768-1769, pp 245-246.*

## July 10, 1868

"Drainage and Reclamation of Marsh Lands Almost every owner of these tide-marshes believes them to be valuable only for their salt hay and mosquito crops. Some few . . . have thought of draining them…to improve the quality of the hay, while others, wedded to old habits and old ideas, are of the opinion that any change from the condition in which these marshes were bequeathed to them by their fathers must of necessity be detrimental. Individuals there are who firmly believe that these marshes are only floating islands, and that once the water is drawn off the islands themselves must settle and finally sink into the bottomless pit. Others believe that subterranean passages exist, connecting these marshes with the sea, and that therefore they cannot be drained."

*Excerpts from a newspaper article from the Jersey City Standard (republished in the Bergen Democrat)*



1873

"Rutherford Park (37 minutes from New York by the Erie Railroad) ... Rutherford Park, being on the beautiful Passaic River, has good boating and fishing. We desire to call attention to choice building lots that are offered at very reasonable prices. Some advertised properties included a 'desirable residence' containing 11 rooms...on six acres with 75 fruit trees and two acres of gardens."

*Real Estate pamphlet - "New Jersey Real Estate," A.D. Mellick, Jr. & Bro., Auctioneers, and Dealers in New Jersey Real Estate, December 28, 1873, pp. 160-161*

1885

"The investigation [of Arthur's Kill von Kull at mouth of Newark Bay] found lots of empty oyster shells and in some places a problem with green slime. Although they didn't find direct evidence of 'acid waste', they were told about it as a major problem at the mouth of Newark Bay. The oystermen claim...that upon a great many days during the past season the water has been covered with acid and oil waste from the factories located along the shores, and it looks very decidedly as if we must look to this cause for the destruction of the oysters whose empty shells we found so abundantly."

*Report of the U.S. Commissioner of Fish and Fisheries for 1885, Washington, DC, U.S. Government Printing Office: 157-163*

1883

"The time was when the entire waters west of the channel, beginning south of Jersey City, and surrounding Ellis and Bedloes' Islands and Robbin's Reef, and a little way beyond Constable's Point, up the Kill von Kull, altogether some six miles in a straight line, was a rich bank of native oysters, and supposed to be inexhaustible."

*Report of the Department of Statistics of Labor and Industry. Part VI. The Oyster Interests of New Jersey, in Documents of State of NJ, p. 225.*

1896

"In its present condition all of this area [Meadowlands and other tidal marshes to the south] is unproductive. It raises a luxuriant crop of coarse sedge and salt grass having little value. It is a breeding place for mosquitoes and other insects. Owing to its trifling value, this marshy area is gradually becoming, and is likely to, in the future, become more and more a site for offensive manufacturing industries, manure piles, and other nuisances."

*Vermuele, Cornelius C. New Jersey Geological Survey Annual Report. Trenton. 1896.*

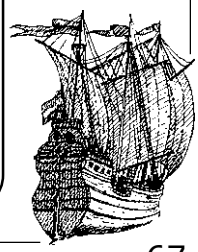


Figure 7A continued

Circa 1927

30,650 acres of meadowland were the "logical location for the region's industrial development."

*Statement from the Bergen County Chamber of Commerce*

1934 near Carlstadt

"On one side were fields of celery and turnips, and on the other was the virgin forest. The birds were very numerous, there were flocks of pine finches, and it was interesting to watch them feeding on the tall reeds, and creeping around the branches of the golden rod to pick off the ripe seeds and any late caterpillar that might still be found there. The Hackensack River is still there and beautiful as ever. Except the Hudson, no stream of water pleases me so well…."

*Descriptions from Joseph Rydings County Walks in Many Fields, Being Certain Choice Annals of the Paterson Ramblin Club.*

1958

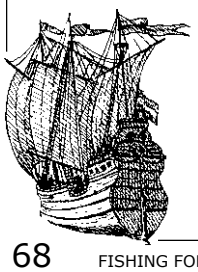
"Of 7,000 acres in Bergen County under the jurisdiction of the Meadowlands Regional Planning Board, 5% was devoted to urban uses, 10% consisted of vacant filled areas and garbage dumps, the remaining 85% being unreclaimed marshland...largely in its natural state altered only by the numerous railroads, utility and highway embankments which cross the area. Literally miles of drainage ditches lace the meadows, a great number of which have been constructed for purposes of mosquito control."

*Report from the Passaic Valley Citizens Planning Association Master Plan Series, Report Number 2: Reclamation Plan, December 3, 1958, p 15.*

1979

"We were among the first to recognize the enormous potential of the Hackensack Meadowlands - and to act upon it. In just seven short years we turned marshlands into a vital, beautiful, bustling world for business and pleasure…."

*Statement from Hartz Mountain Industries taken from The Hackensack Meadows: A Natural and Unnatural History by Bruce Baldi. 1981.*



1996

"As I grew older, the Hackensack River was for us a place to swim, crab and go row boating. It played a big part in our lives. Then came the chemical and oil plants that polluted this river with no regard for the outcome. State and local inspectors did not stop the abuse. There were some politicians who received their monthly checks to look the other way. In addition, over the years, many businesses used the river as a sewer line, as well as some towns dumping raw human sewage into the river."

*Interview with Secaucus Mayor Anthony Just from the Secaucus Reporter, Volume 9, Number 14, Sunday, April 28, 1996.*

1996

"The threat to this river, in one word is development," said Captain Bill Sheehan, Hackensack Riverkeeper.

*The Secaucus Reporter, Volume 9, Number 14, Sunday, April 28, 1996.*

1996

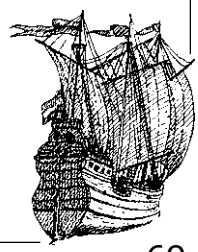
Margaret Bowman, a staff member of the American Rivers, says, "This river is on the upswing. It is in the process of recovery, but without those wetlands, the health of the river is never going to completely recover."

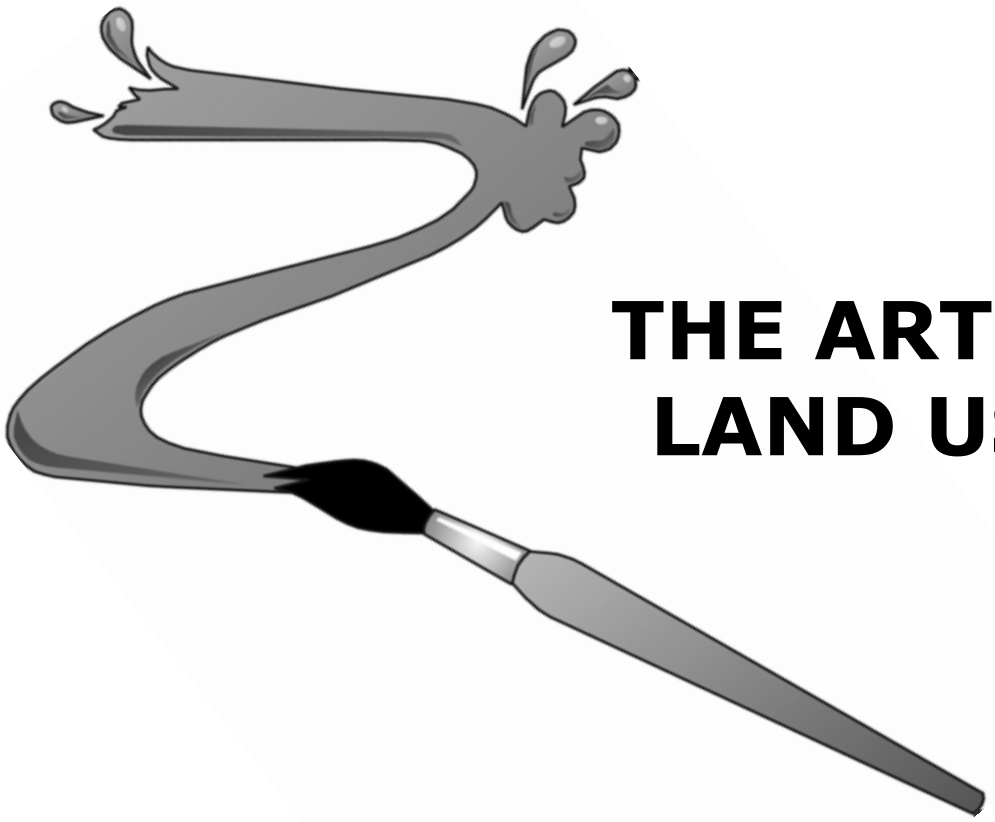
*The Secaucus Reporter, Volume 9, Number 14, Sunday, April 28, 1996.*

1996

"The Hackensack Meadowlands Development Commission (HMDC) was created to reverse the degradation that had been going on here - in the most assaulted wetlands in the U.S. - for almost 100 years. We have done much to reverse that negative pattern."

*Statements from the Meadowlands Chamber of Commerce, October 1996*

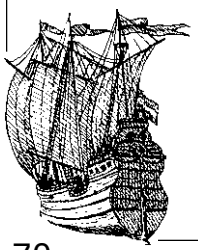




# THE ART OF LAND USE

## BACKGROUND INFORMATION

People have always altered the land to suit their needs. Native Americans that lived in the area cut trees to make boats and shelter and to use for fuel. They cleared patches of land for gardens, campsites, and villages. They set fire to forested lands to encourage certain game species (like deer) and to make travel easier. Our understanding of this type of land management comes from Native American stories that have been passed down through the generations and interpretation of artifacts and artwork.

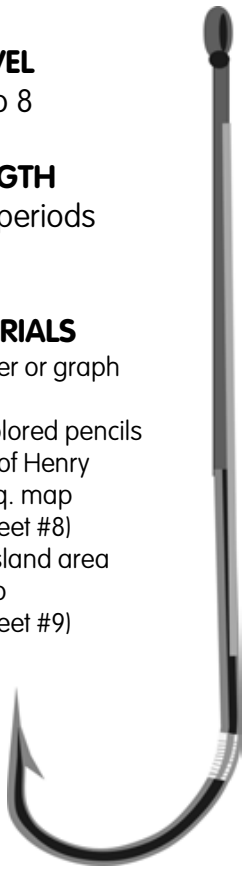


As the settlers arrived in the Newark Bay Complex, they brought with them European ideas of how the land should be viewed and used. Although land was cleared for some of the same reasons as the Native Americans, the European land ethic was different as they struggled to cultivate the wilderness to emulate what they left behind in England, France, Spain, and the other western European countries. As more immigrants arrived, the land not only had to support the burgeoning population around New York City, but it also became a useful tool for increasing and encouraging trade of products made from the region's natural resources. Land use from the time of early settlement is understood by interpreting numerous written documents (land deeds, bills of sale, etc.) as well as maps.

**LEVEL**
5 to 8

**LENGTH**
3 class periods

**MATERIALS**
- drawing paper or graph paper
- crayons or colored pencils
- The Property of Henry Kingsland,Esq. map (Discovery Sheet #8)
- Current Kingsland area land use map (Discovery Sheet #9)



## OVERVIEW

Maps teach us about historical and present-day land use practices.

## OBJECTIVES

Students will:

- Create a graphic that illustrates present land use practices;
- Interpret maps to describe land use practices;
- Explain how land use has changed in a specific area over time;
- Draw inferences about how land use affects environmental quality.

## ADVISORY LINK

**The Fish Consumption Advisories were developed to educate anglers about health risks involved with consuming certain fish and crabs from Newark Bay Complex waters. By-products from industrial, commercial and residential practices have altered the quality of the estuarine ecosystem where these animals live.**
**By comparing historic and present day land use practices, we may better be able to understand how these practices have impacted the ecosystem over time.**

**STUDENT PREREQUISITES**

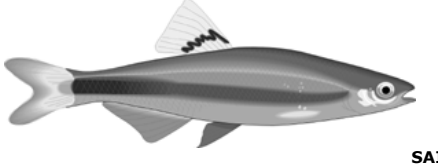
Map reading

**KEYWORDS**

commercial
industrial
land use
land use planning
residential
zoning

**PROCESS SKILLS**

communicating
comparing
categorizing
interpreting information
classifying
analyzing
inferring
synthesizing
formulating hypotheses



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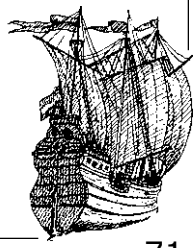


## PLANNING

Make one copy of Discovery Sheets #8 and #9 for each student.

## PROCEDURE

## SETTING THE STAGE

Have the students create a list of places in their neighborhood and what use each of the places has. Examples - supermarket/food; temple/worship; school/education; house/ shelter; video store/ entertainment; apartment/shelter; park/recreation; deli/food; church/ worship. Discuss how these individual uses can be combined to create similar groups of uses.

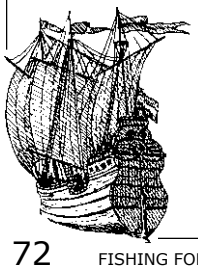
## THE ACTION


**Period 1**

1. Duplicate the process used in "Setting the Stage" to help generate a list of places that are present on the school grounds.
2. Partner students and have each pair create a bird's eye view map of the school grounds showing all the places on their list. Discuss strategies for determining how to locate these different sites on a map (relative location, size comparisons, and directions).
3. Each map should contain a symbol key to identify the sites. Remind students that places with the same use should reflect the same symbol. Example: kindergarten playground, ball field, and blacktop playground are all recreation.
4. When the maps are finished, have the students assess each other's work for clarity, neatness and practicality (would a person be able to find their way around the school grounds using the map).
5. Discuss land use and land use planning as a way to identify, categorize, and code the ways that people use the land in the town, county, region, state, etc.
6. Ask students to describe what people, agencies, or organizations would benefit from this method of categorizing land use and why. [*developers, town planners, environmental agencies, etc.*]

**Period 2**

1. Read aloud "Description of an 18th Century Farm and Homestead" (Figure 8A)
2. Generate a list of the types of land these early settlers needed in order to maintain a working farm and homestead. Discuss.
3. Divide the class into pairs of students. Distribute "The Property of Henry Kingsland, Esq." (Discovery Sheet #8) to each pair and have them study this map to determine how one family (the Kingslands) used their land.



**Period 3**

1. Distribute the "Current Land Use" map (Discovery Sheet #9). Explain how this map covers the same area as the historic map; information on this map comes from town and government sources.
2. Compare the two maps and have students describe any changes. Ask the students to speculate how these changes may have occurred.

FIGURE 8A

# DESCRIPTION OF AN 18TH CENTURY FARM AND HOMESTEAD

The typical eighteenth century farm in the Hackensack valley depended upon the river for transportation of bulk commodities and therefore would have to be conveniently situated near a public dock. It might contain upwards of 150 acres, half of which would be cleared land "neatly divided into Tillage, Meadow, and Pasture." A domicile, preferably a good stone house, and a large barn serving as a granary would be situated on the upland or terraces above the river, close to the public highways that generally maintained a somewhat level gradient by following the contour of the ridges. Overland transportation was conducted by horseback, wagons and sleighs. This upland would have to provide a sufficiency of good water and a woodlot supplying enough timber for fuel and fences. Large apple orchards of about 120 trees, together with other fruit trees, would also occupy the well-drained slopes. Tidal flats [would bear] natural crops of salt grasses and reeds. Salt grass was therefore seasonally mown just before ripening and stored for animal-bedding and fodder. Most Bergen Dutch farms were oriented to the production of cereal grains, respectively, rye, corn, buckwheat, wheat and oats. Gristmills would have to be conveniently located for the conversion of kernel to flour and feed.

FIGURE 8B

## SUGGESTED ANSWERS TO MAP QUESTIONS

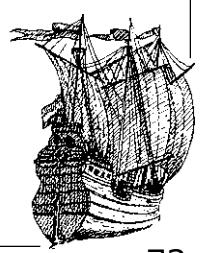
### Historical Map of Kingsland Property

1. Information could be found on other old maps, in deeds and in historical descriptions of Kingsland's land.
2. 257 acres
3. All of the Kingsland family's life needs had to be provided for on their property. Transportation was primitive according to today's standards, therefore they did not travel far for their necessities. There were no supermarkets or shopping malls to visit and buy items or materials, but they may have sold part of their crops to buy things they could not produce.
4. The homestead was close to the main road to make it easier for transportation and visitors, especially in bad weather. It was also in proximity to the freshwater creek.
5. Most likely from the creek that ran behind the homestead.
6. The property contained a variety of habitat types. The orchards provided food. The trees in the woodlands could be used for fuel, the salt meadow provided salt hay for farm animals or for sale, and the property was close to the river and one of the main roads for transportation.
7. Wooded areas may have been logged for firewood and turned into fields. People plant orchards, therefore the land must have been cleared.

### Current Land Use map

1 & 2 See key on map.

3. Similarities – land was and is used for transportation, building, industry, commercial ventures; Differences – redistribution of natural habitats and residential areas, presence of the cemetery, no stream.
4. When a pattern is established it may be difficult to break that pattern; when an abundance of resources is recognized they may tend to be used for individual or commercial gain.
5. The surrounding ecosystems are mostly affected by the area's non-point source pollution including litter, road runoff and fertilizers.



## ASSESSMENT STRATEGIES

Have the students:

- ❑ Plan an imaginary town that incorporates general land use types. Ask them to present the plans in some visual form, i.e., model, computer image, architectural drawing, etc. Have other students assess the completed maps for the degree of environmental impact.

## STAYING INVOLVED

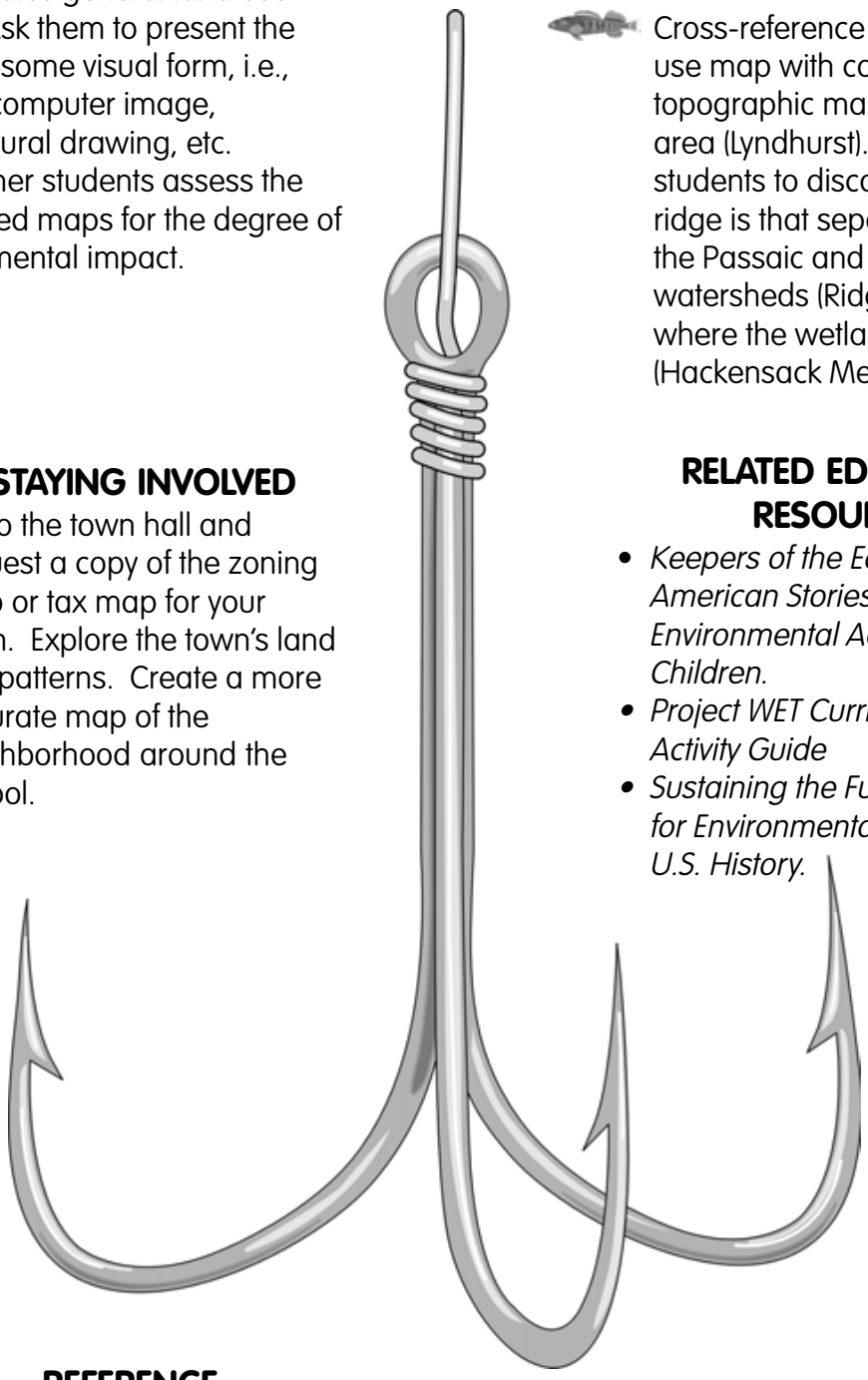
- Go to the town hall and request a copy of the zoning map or tax map for your town. Explore the town's land use patterns. Create a more accurate map of the neighborhood around the school.

## EXTENSIONS

- Have the students create 3-D models of each map.
- Cross-reference the current land use map with county and topographic maps of the area (Lyndhurst). Challenge the students to discover where the ridge is that separates the Passaic and Hackensack watersheds (Ridge Road) and where the wetlands are (Hackensack Meadowlands).

## RELATED EDUCATION RESOURCES

- *Keepers of the Earth: Native American Stories and Environmental Activities for Children.*
- *Project WET Curriculum and Activity Guide*
- *Sustaining the Future: Activities for Environmental Education in U.S. History.*



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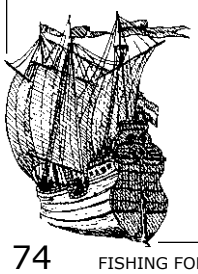
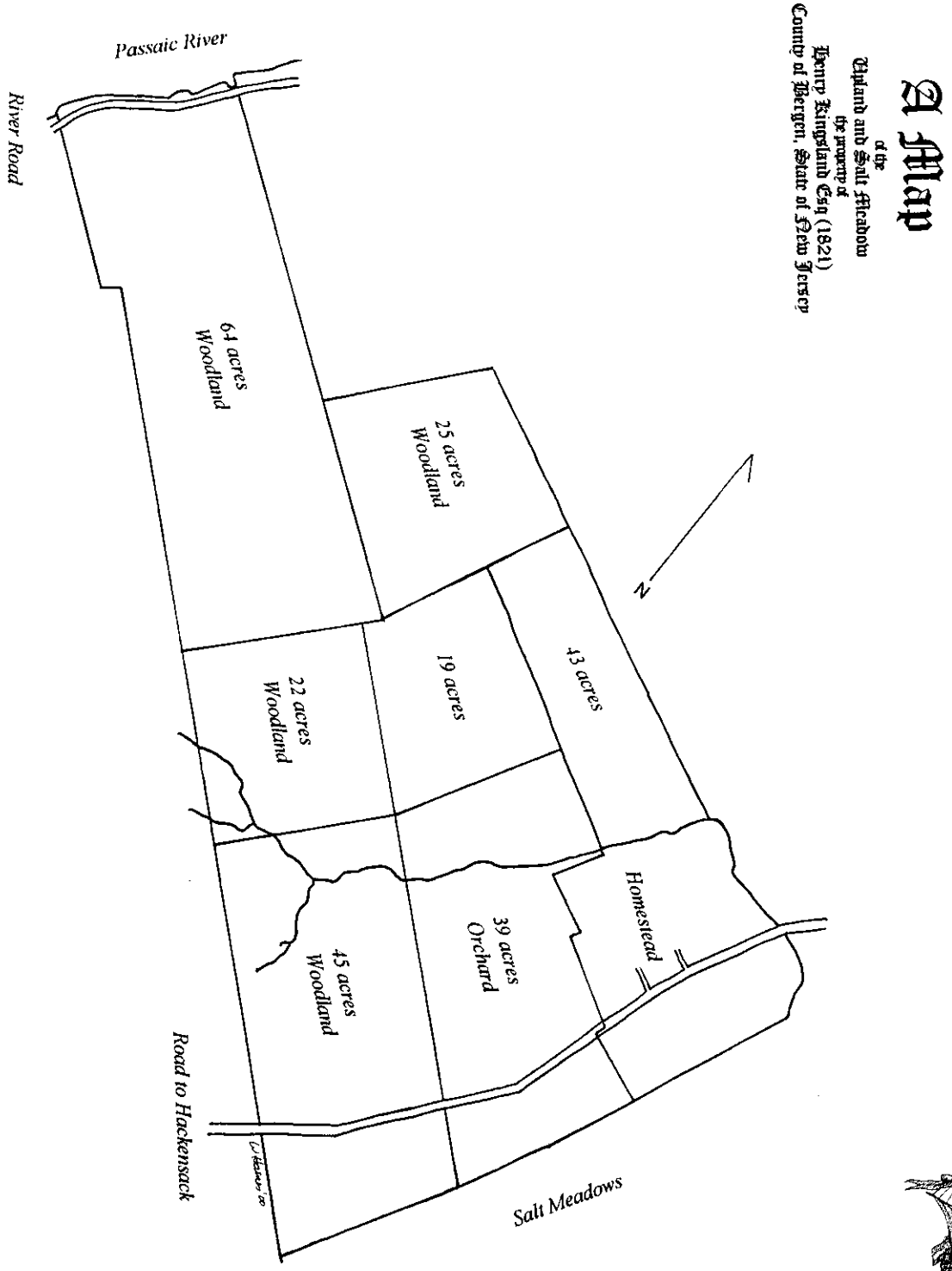


# THE PROPERTY OF HENRY KINGSLAND, ESQ.

(November 12, 1821)

## Discovery Sheet #8




Map courtesy of Bergen County Administration Office, Hackensack, NJ.
(Map has been reduced, printed scale is not valid)

# HISTORIC MAP OF THE KINGSLAND PROPERTY

## Discovery Sheet #8

Name: _____ Date: _____

Color code the map according to land use types. Create a key.

1. What should be done for areas of the map that cannot be coded? How might that information be found?

2. What was the total number of acres owned by the Kingsland family?

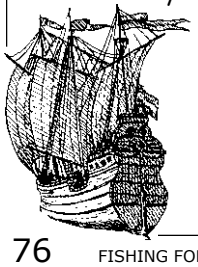
3. Why did the Kingsland family require that many acres of land?

4. Why do you think the homestead portion of the land was located where it was?

5. How do you think the members of the Kingsland family got their drinking water?

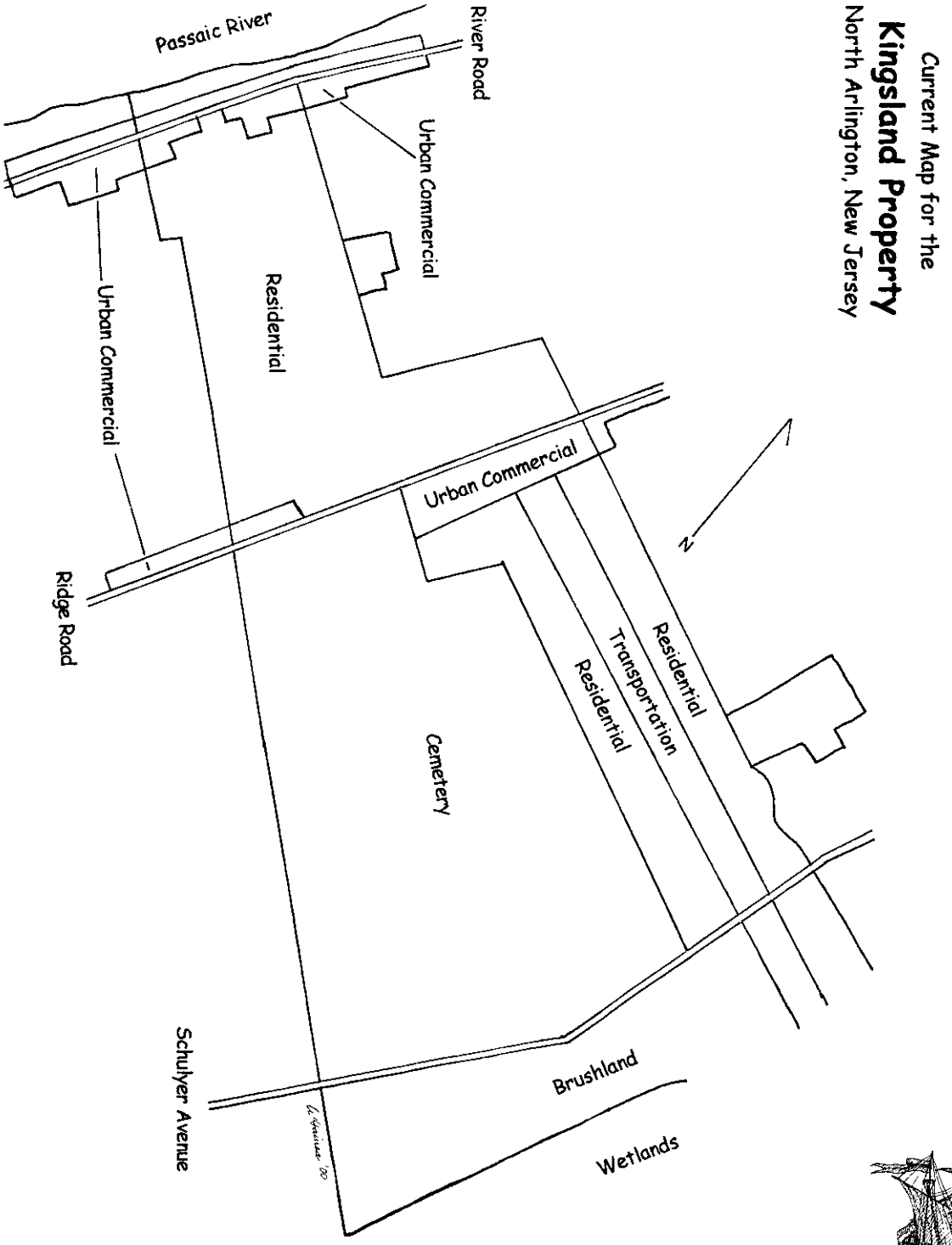
6. What were the advantages of where the Kingsland family settled?

7. How do you think the Kingsland farm and its land use affected the surrounding ecosystems?



# CURRENT LAND USE OF THE KINGSLAND PROPERTY

## Discovery Sheet #9




This information has been modified from Geographical Information System (GIS) data provided by the New Jersey Department of Environmental Protection. All information is approximate.

# CURRENT LAND USE MAP

## Discovery Sheet #9

Name: _____ Date: _____

Color code the map according to land use types.
Create a key. Where appropriate, use the same codes on this map as on the historical map).

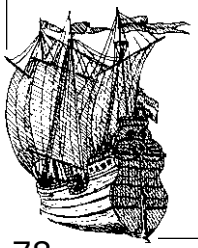
1. How might the current land use areas look if one was to visit them?

2. What are some of the present-day uses of the area that was once the Kingsland property?

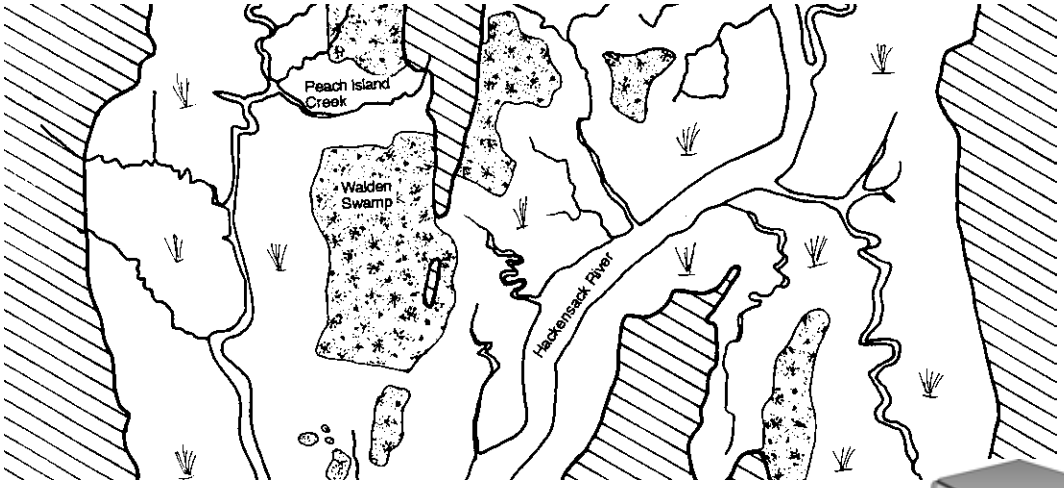
3. What are the similarities and differences between historical land use and present day land use?

4. Do you think historical land use patterns led to present day land use patterns? If so, how? If not, why?

5. How do you think these present day uses affect the surrounding ecosystems?



# ONCE THERE WAS A FOREST



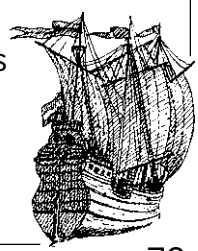

## BACKGROUND INFORMATION

The Newark Bay Complex is rich in natural resources. These resources are used for commercial, industrial and residential purposes, as well as for providing open space for recreation. These resources also are part of diverse ecosystems that function in many ways to help control flooding, filter impurities from surface water, determine drainage patterns, and provide habitat for wildlife.

In the past, Atlantic white cedar forests dotted the marsh. Cedar trees were used to create products such as shingles and wooden kegs because the wood was resistant to decay. Salt hay was harvested from the marsh for cattle; peat was removed from the marsh for fuel; and clay was extracted for making bricks. Basalt, an igneous rock, was mined from Snake Hill; there was a copper mine located in North Arlington; and oysters were harvested extensively in the Newark and Raritan Bays. Although some of these resources are still present in the Complex, most are no longer available in quantity or quality to make them profitable for human use.

The natural resources still used and enjoyed by the people of the area are not as product-oriented as in the past. Fishing the waterways continues to be extremely popular and there are numerous marinas in the area for people to launch their own boats or arrange for a charter trip. Many parks and other public access places encourage recreational fishing. Hunting of game species was historically popular and this sport continues today. People canoe, kayak, watch birds and butterflies, walk, and photograph nature throughout the Newark Bay Complex.

In order to devise comprehensive land use strategies for this pressured area, planners, officials, engineers and other involved parties draw on an understanding of historical events and review the consequences of various decisions. The case of the disappearing cedar forests in the Newark Bay Complex is a good study that shows multiple impacts on a resource.



**LEVEL**
5 to 8

**LENGTH**
4 class periods

**MATERIALS**
- Historic map of Cedar Swamps (Discovery Sheet #10)
- Current Land Types map (Discovery Sheet #11)
- Once There Was A Forest story (Figure 9A)
- Once There Was a Forest worksheet (Discovery Sheet #12)
- crayons or markers
- overhead projector
- 2 overhead transparencies
- pictures of Atlantic White Cedar
- cedar boards or closet blocks of cedar

## OVERVIEW

Historical information from maps and written accounts tell how our ancestors used available natural resources.

## OBJECTIVES

Students will:

- Describe events or forces that caused the cedar forests of the Newark Bay Complex to disappear;
- Discern between substantiated fact and factual interpretation;
- Explain how natural occurrences and human manipulation can affect habitats and ecosystems;
- Demonstrate how learning about historical events can lead to a better understanding of current problems and their possible solutions.

## ADVISORY LINK

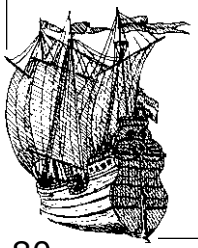
**The Fish Consumption Advisories suggests behaviors that will decrease an angler's likelihood of eating contaminated fish and crabs. This document was created after scientists conducted research and reviewed current scientific data as well as historic accounts. They were then able to determine the best course of action for dealing with an environmental health problem in the Newark Bay Complex.**

**KEYWORDS**

brackish
land reclamation
land use management
mitigation
natural resource

**STUDENT PREREQUISTES**

A basic understanding of the habitat requirements of plants
A basic understanding of marsh and swamp habitats
An understanding of how people use natural resources
An understanding of land use
Map reading



**PROCESS SKILLS**

comparing
analyzing
formulating hypotheses
synthesizing
interpreting data

## PLANNING

1. Make enough copies of the maps (Discovery Sheets #10 and #11), the story (Figure 9A), and the Once There was a Forest worksheet (Discovery Sheet #12) for each student or pair of students.
2. Make one set of overhead transparencies for the maps.
3. Obtain visuals or examples of Atlantic white cedar and red cedar as well as products made from their wood.
4. Obtain a photo or drawing of an Atlantic white cedar forest

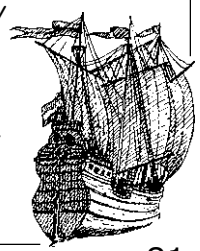
## PROCEDURE
## SETTING THE STAGE

Ask the students, "What are some events or forces that you have seen that have changed how the land is used or how a land area looks"? (Examples: development in the town, new highway, landscaping around a house or park, hurricane damage along the coast, flooded roads, wind/ice damage.)

## THE ACTION


**Period 1**

1. Distribute a copy of the Current Land Use Map (Discovery Sheet #11) to each student or pair of students.
2. Tell the students to color code the map using the key.
3. Display a transparency of the map on the overhead projector. Have the students categorize the types of land into those that are more natural vs. those that have more built qualities. [*water, brushland, salt marsh, recreation, non-tidal marsh vs. transportation, industrial, and commercial* ]
4. Discuss what types of natural resources would be present or available in the more natural habitats or land use areas and how they would be used. [*Examples: water - fishing for recreation, waterways for transportation; brushland - habitat for small animals; salt marsh - habitat for animals and plants; open space for recreation activities and, habitat for animals and plants*]
5. Distribute a copy of the Historic Map (Discovery Sheet #10) to each student or pair of students.
6. Tell the students to color code the map using the key then describe what the landscape might have looked like (i.e. include degree of moisture, types of plants present, possible animal species, etc.). Ask the students to list the types of natural resources that might have been present in each of these habitat types and speculate how early settlers may have used them. [*Examples: water - fish and shellfish for eating, the waterway for transportation and discharge of waste, habitat for aquatic animals; upland - trees for building and fuel, habitat for game animals; cedar forest trees for building, manufacturing products such as shingles, kegs, and barrels, aesthetics; marsh - salt hay production, peat production, habitat for wildlife and plants*]



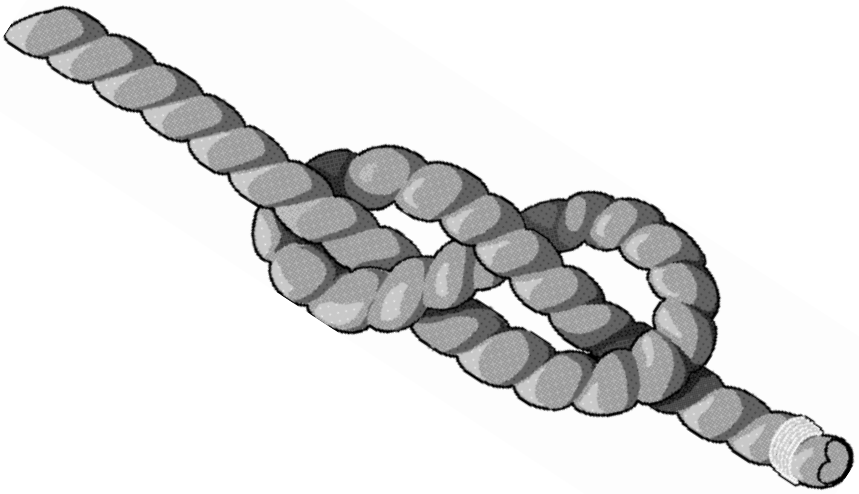
7. Ask the students, "Where could we go to verify or expand upon our habitat resource list"? [*Look through historical records from biologists, manufacturers, fishermen, hunters, etc.*]
8. Overlay the two maps. Ask the students to compare their maps. How has the area changed over time? How do you think resource use has changed? Brainstorm a list of possible events or forces that may have contributed to the changes.

**Period 2**

1. Ask the students if anyone has ever been to a cedar forest or has seen a cedar tree. Or, pass out cedar blocks / boards for the students to observe. Have the students share their impressions.
2. Discuss the differences between Atlantic white cedar to red cedar. Use visuals or examples to help generate a list of each tree's characteristics and habitat requirements.
3. Discuss the uses of cedar. [*closets, water kegs and barrels, shingles, cedar chips for animals, cedar plank roads*] Use visuals or examples if possible.
4. Introduce the case of the disappearing cedar forest by telling the students that there are several theories as to why the forests disappeared. It is the students' challenge to determine what is the most likely explanation.
5. Distribute a copy of "Once There Was A Forest" (Figure 9A) to each student. Have the students share the reading of the selection aloud.

**Period 3**

1. Distribute Discovery Sheet #12 to each student or pair of students. Have the students re-read the story and then create a concept map to illustrate what contributed to the disappearance of the cedar forests. (See Figure 9B.)
2. Discuss how each factor could be proved or disproved.



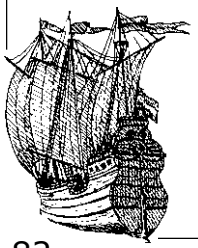
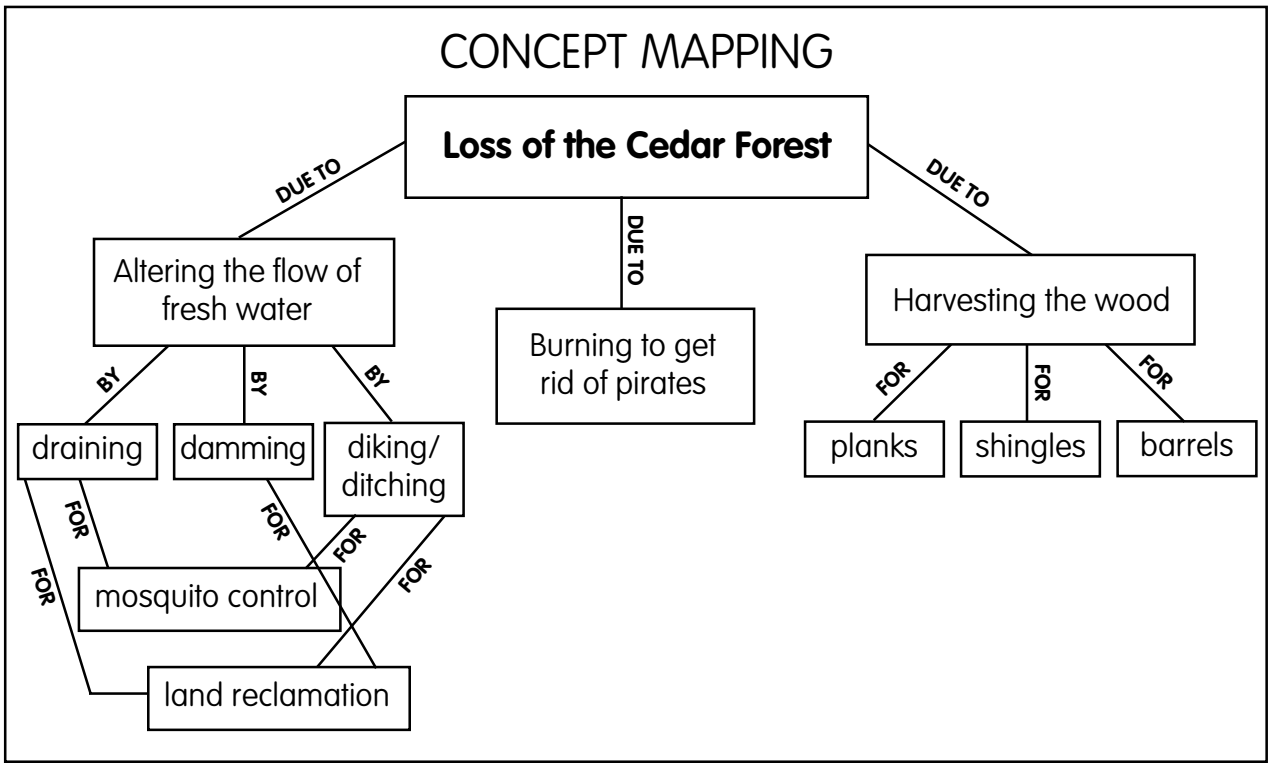
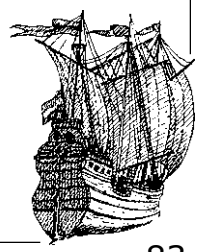


FIGURE 9B




## CLOSING DISCUSSION

1. What examples of disappearing forests do we have today? [*rainforests from clear cutting for farming and grazing; temperate, deciduous forests for development; hemlock forests from the woolly adelgid, an introduced insect*] What factors do you think have the most impact on forests that are disappearing today?
2. What does this story tell us about human actions towards some resources? [*purely views resources for human consumption; people sometimes do things without assessing the consequences; desire for the resources sometimes outweighs environmental impact*]
3. List human behaviors that you see pertaining to resource use in the Newark Bay Complex. [*Grassroots environmental organizations work to save habitat; creating new habitats through mitigation; informing people about potential health problems; using government funds to establish regulatory agencies; developing new ways to address environmental issues; pollution continuing in various forms; habitats are altered or degraded.*]



## ASSESSMENT STRATEGIES

Have the students:

- ❏ Create a chronology of the disappearance of the cedar forests.
- ❏ Illustrate or dramatize "Once There Was A Forest".
- ❏ Write a cause and effect statement for one or more of the factors contributing to the disappearance of the cedar forests.
- ❏ Complete the following in essay form: The disappearance of the cedar forests in the Newark Bay Complex has (no, little, much) impact on me because:

## STAYING INVOLVED

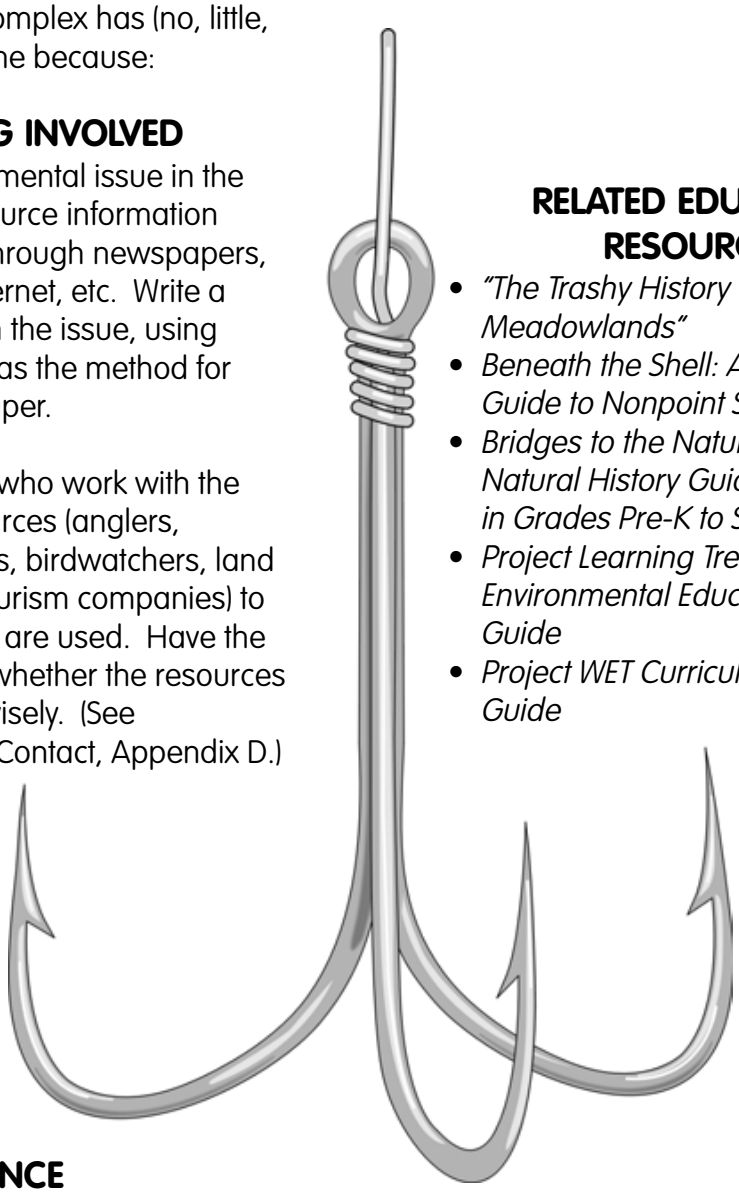
Select an environmental issue in the area, gather resource information about the issue through newspapers, television, the Internet, etc. Write a position paper on the issue, using cause and effect as the method for structuring the paper.

Interview people who work with the current day resources (anglers, hunters, canoeists, birdwatchers, land managers, ecotourism companies) to find out how they are used. Have the students assess whether the resources are being used wisely. (See Organizations to Contact, Appendix D.)

## EXTENSIONS

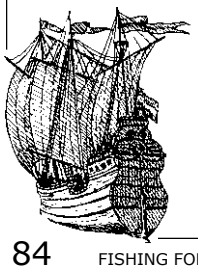
Compare the current land use map to GIS-generated maps available though the Internet and through the NJ Department of Environmental Protection.

Write a screenplay for the story; act it out for another class.



## RELATED EDUCATION RESOURCES

- *"The Trashy History of the Meadowlands"*
- *Beneath the Shell: A Teacher's Guide to Nonpoint Source Pollution*
- *Bridges to the Natural World: A Natural History Guide for Teachers in Grades Pre-K to Six*
- *Project Learning Tree: Environmental Education Activity Guide*
- *Project WET Curriculum and Activity Guide*



## REFERENCE


Collins, Beryl Robichaud and Karl H. Anderson. *Plant Communities of New Jersey.* Rutgers University Press, New Brunswick, NJ. 1994.

Longman, Phillip. "*Pirates of the Meadowlands*" New Jersey Monthly. January, 1983.

Wright, Kevin. *The Hackensack Meadowlands.* An unpublished report for Hackensack Meadowlands Development Commission Environment Center.

FIGURE 9A

# ONCE THERE WAS A FOREST

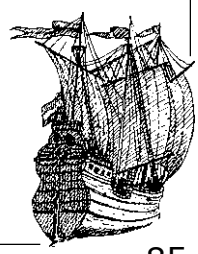
Brom Polter's wagon creaked along the dense forest road. He was late coming home from market at the wharf, but it had been a profitable trip. He sold all the vegetables he had brought from his small farm, and his money pouches were full. The Polter farm was perched on a high table of land overlooking the wide expanse of trees and marsh, which stretched to the harbors that served the bustling city of New Amsterdam. As the wagon rolled homeward clouds drifted across a steamy summer sky and veiled the moonlight. The broad meadow halted abruptly and he entered the thick cedar forest. "Just another two miles," he thought, "my dinner will be waiting for me." His wife, Hilda, was a good cook and the thought of a tasty meal drew him along the dark lonely road distracted by thoughts of the food waiting and coins to be counted. The drone of mosquitoes was the only other sound besides the soft clip-clop of his horse's steps on the dirt road.

As the road wound through the swampy part of the cedar forest, heavy branches created a thick darkness, blotting out any remnant of moonlight. Brom slowed the wagon. The sudden rustle in the trees above did not disturb him. "It's some raccoon starting on his nighttime foray, looking for dinner, just like me." But in the next moment, three masked robbers dove down on Brom and pummeled the poor man senseless. He lay unconscious as the thieves ran off into the swamp with the bags of money. The muddy trail swallowed the robbers into the darkness without a trace.

Brom lay by the side of the road. His horse, a creature of habit, trotted home to his stall and oats. "O, Gott in himmel", Hilda cried, "something has happened to my Brom!" The neighbors rallied from miles around and went out with lanterns along the lone road, across the old cedar swamp forest, toward the river settlements. It was a familiar road that grew busier every day. Since the late 1600's, industry in the area had grown. Many were farmers, like Brom Polter, but some cut and sold the great white cedar trees. Everyone knew the single road that led through the tall trees and marshy swamps.

"I found him," shouted Will Smythe. "He's hurt, but still alive!" The small company divided. Some tended Brom, checking his wounds and listening to how robbers had stolen his earnings of the day. They bundled him into a wagon and took him home to Hilda.

"Jim Barclay, John Mason, and you lad, Pieter von Stod, come with me," ordered Will. "We worked this part of the woods just a few months ago. Let's see if we can find the trail the robbers took and get Brom's money back." The little band followed the trails they themselves had helped make through the forest as they harvested the lumber to make barrels, containers, roof shingles, planks, and poles. The ground was dry in some areas but ankle deep in water most of the time. It was easy to rob an innocent traveler on the road and escape into the wet, mosquito infested swamp without leaving a trail. Pirates of old were changing their thieving ways. The seas were well patrolled now and capture of ships was not as easy or profitable. New Amsterdam, once a safe harbor to sell and store their loot, was now a bustling seaport. Ships from many nations came here. The English were especially troublesome for these robbers of the sea. Pirates now infested the meadowlands, preying on unsuspecting travelers.



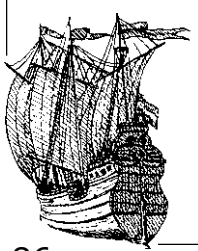
As the little band trudged through the swamp, each thought of the increasing dangers of the road to the harbor towns. Young Tom and Becky Dawson were attacked and robbed. They killed

Tom and poor Becky was never seen again. A few months later a lumberman found her bonnet stuck to a branch in the woods. The Wilson boys, merchant seamen, were robbed and killed as they were making their way home. Hadn't been home in three years. The widow Wilson was so proud of her boys. She hasn't spoken to anyone since that happened. Must be five years or more. All recalled some tragedy that touched them personally.

Pink dawn brought some light to the steamy swamp, but hope dwindled in the hearts of the search party and they trudged back to the main road and home. On the way, a plan was forged. Enough! They would put a stop to this. They were not ripe fruit to be plucked and devoured by ravaging hoards. In the next few months, all the neighboring towns agreed to raid the hiding places where pirates were known to hide. For weeks, battles raged, cannons fired, and many hideouts were abandoned. The last of the bandits fled into the cedar forests of the marshlands.

"Burn the meadows and forests!" The people, now in a frenzy of rage and excitement set fire to all the meadows from the Arthur Kill to the harbor towns across from New Amsterdam. Pirates died in the blaze and some were captured, tried and executed. In the end, the roads became safe, but the fire took its toll on the cedar forests of the area.

The five-mile trek from the harbor towns to the high ground and farms in the west was now a vast open meadow. Tidal waters flowed into the fresh marshes. Brom's children of seven generations still drove their produce by wagon through the meadowlands to Hoboken and New York. Out in the marsh men stood in long lines with picks and shovels. They were digging. "Great progress going on here", said the old farmer to his son. "The ditches and dikes these folks are building will keep the tide waters out. Make room for farms and grazing lands for cattle."



"What are those old blackened posts, Papa?" asked the boy.

"Ah, the old folks tell stories about a forest that was a hideout for raiding pirates. They say the people set fire to it to chase the pirates. They say they are the stumps of the old trees. Fancy story. Don't know if it's true."

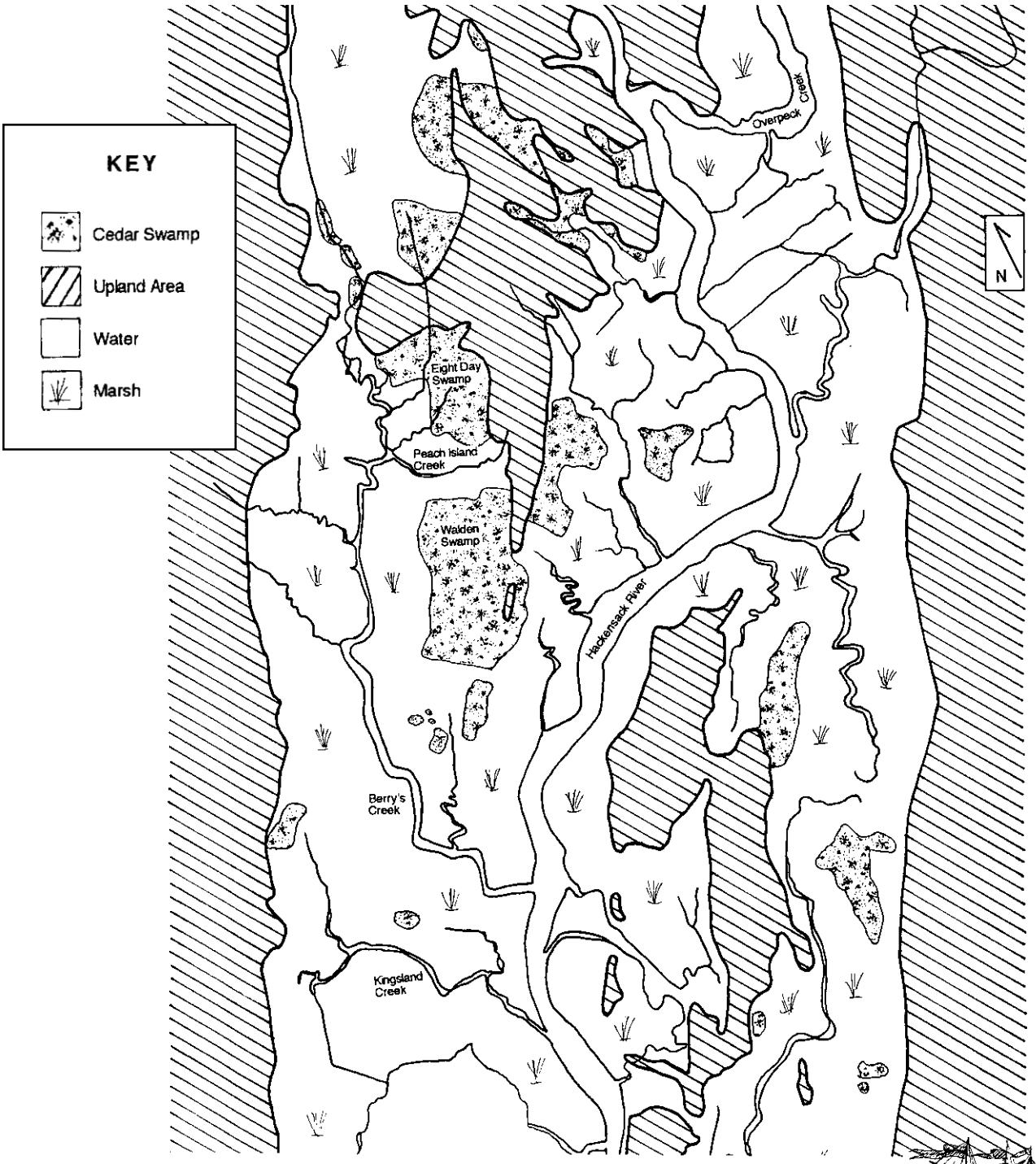
Farming and grazing in the meadowlands was somewhat successful, but by the early 1900's malaria became common to the people of the area. Mosquitoes that breed in shallow, still water carried the fatal disease. In 1904, John Smith wrote, "These dead end ditches in the meadows are one of the worst breeding places for mosquitoes in the state." The canals had no outlets through the embankments. The mosquitoes were the new raiders of neighboring communities. They were huge, came in swarms, and if they did not infect with the deadly malaria, they left itching welts on those who went beyond screened porches in the summer. From 1900 to 1950 Mosquito Commissions from various counties surrounding the meadowlands worked to drain the pools of water and repeatedly sprayed the pools and ponds with lightweight oil to prevent the mosquito larvae from becoming adults.

The flow of water through the meadowlands was greatly altered and the system became more and more brackish with saline tidal waters. Construction of Oradell Reservoir in 1922 also reduced freshwater flow downstream. The last of the great cedars finally died around 1939. But in some places, charred stumps can still be seen where once there was a forest.

*Written by Patricia F. Kane*

# HISTORIC MAP OF CEDAR SWAMPS

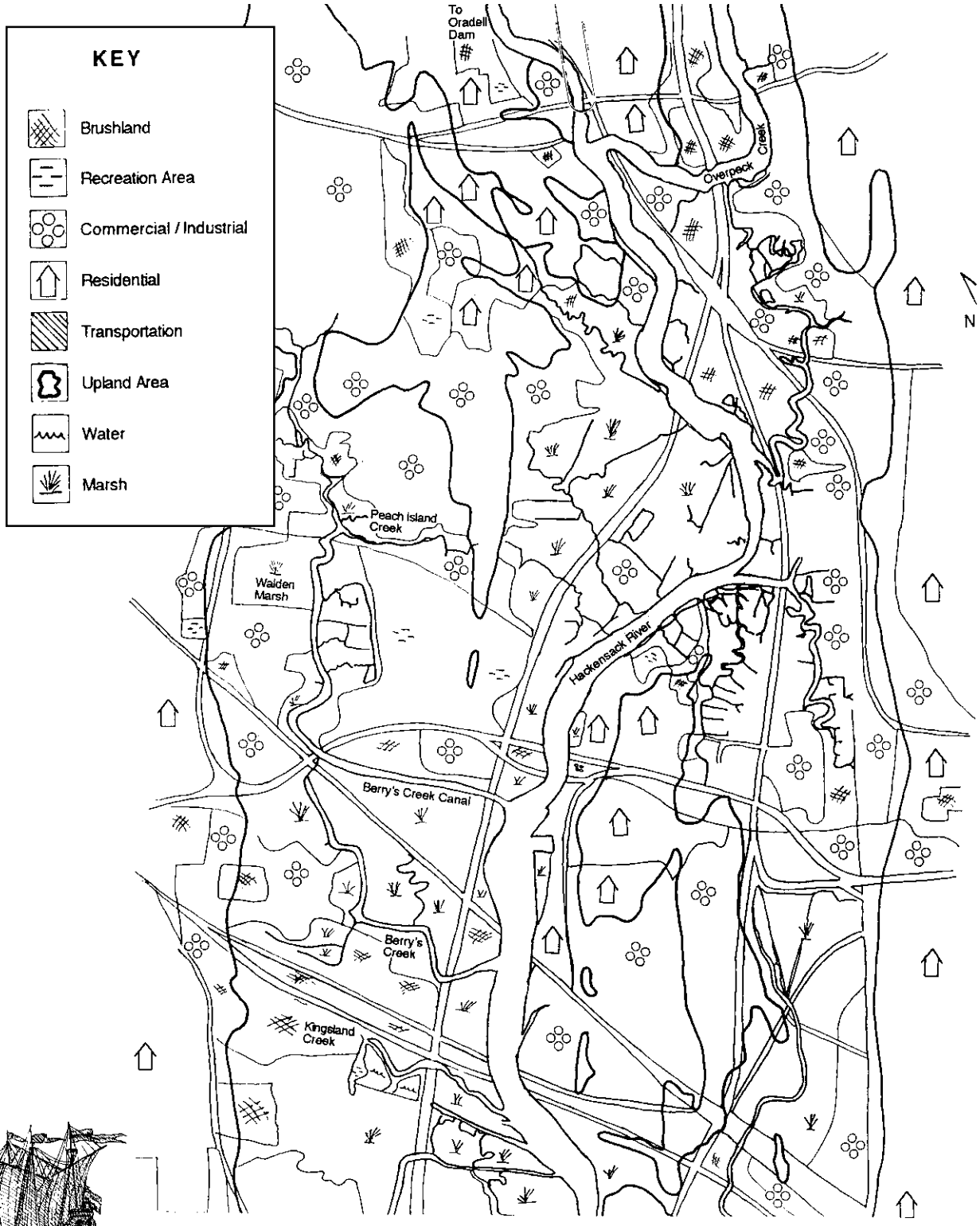
Discovery Sheet #10




Adapted from A Cartographic Impact Evaluation of HMDC Development Alernatives on Known and Potential Prehistoric and Historic Resources Within the Hackensack Meadowlands, New Jersey. EPA Contract No. D102182QZ. Prepared by Joel W. Grossman, Principal Investigator of Grossman and Associates, Inc. for EcolSciences, Inc., February 4, 1992.

# CURRENT LAND TYPES MAP

## Discovery Sheet #11




This information has been adapted from NJDEP Geographic Information System data.

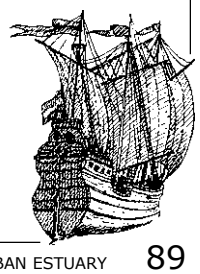
# ONCE THERE WAS A FOREST

## Discovery Sheet #12

Name: _____ Date: _____

Create a concept map for the story to answer the following question:
What happened to the cedar forests in the Newark Bay Complex?

Which of the factors listed do you think had the most impact on causing the cedar forests to disappear? Why?

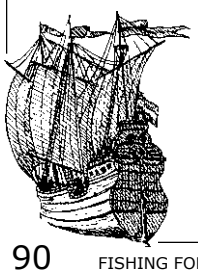


# MAP DETECTIVES

## BACKGROUND INFORMATION

At the time of New Jersey's first census in 1726 the state's population was 32,442; it had grown to 149,435 by 1784. By 1900, the population had jumped to nearly 2,000,000 and by 1990 the entire state's population had increased to 7,730,000. Approximately 49% of this population (3,775,344) lives in the six counties that border New York (Bergen, Passaic, Hudson, Essex, Union, and Middlesex). It is within these six counties that the Newark Bay Complex exists.

Resource distribution and technological advances played a major part in how this population became distributed over time. At the time of the Native Americans and the early European settlers, water travel and foot or horse travel were the modes of transportation. Landform barriers such as mountain ranges, cliffs, and even some waterways prohibited mass settlement away from the cities. As the population of cities increased and more advanced technology was invented or discovered, people found opportunity to move away from industrial centers to the outlying areas. This expansion movement blossomed in the 1800's and continues today by making rural areas more accessible.



New Jersey has 567 municipalities located in 21 counties and each municipality has, by state law, the right to plan and zone its own land use. Historically there was little discussion between town managers about how one town's projects (or growth) affected another town and its resources. Roads, commercial and industrial sites, landfills, residential development, recreational complexes and shopping malls were built without much regional planning. Many of the challenges that arise in dealing with the environmental issues of the area include providing open space habitat, clean water, and clean air. These become challenges because of people's differing attitudes towards the environment, the economy, their lifestyle, quality of life issues, and personal freedoms. Since environmental problems and concerns transcend municipal boundaries, conflicting land use is a serious concern in New Jersey.

**LEVEL**
6 to 8

**LENGTH**
3 class periods

**MATERIALS**

**Maps:**
- Native Americans in the Newark Bay Complex Before the Dutch Settlers (Figure 10A)
- The Newark Bay Complex (circa 1720) (Figure 10B)
- The Newark Bay Complex (circa 1871) (Figure 10C)
- The Newark Bay Complex, Today (Figure 10D)

**Discovery Sheets:**
- #13 Native Americans in the Newark Bay Complex Before the Dutch Settlers
- #14 The Newark Bay Complex (Circa 1720)
- #15 The Newark Bay Complex (Circa 1871)
- #16 The Newark Bay Complex, Today

## OVERVIEW

During the last 400 years technological advances have changed the manner in which people move about the state, country and world. These changes also have affected population distribution throughout the Newark Bay Complex.

## OBJECTIVES

Students will:

- Describe how advances in transportation technology affected population distribution in the Newark Bay Complex over time;
- Discern between life needs and life wants as they relate to the student's lifestyle.
- Explain how population density affects the use of natural resources;
- Describe how regional planning would affect the use of natural resources and ecosystem health.

## ADVISORY LINK

**The resources of the Newark Bay Complex have provided a basis for continuous population growth since the 1600's. Human ingenuity and technological advances have further developed the infrastructure to support this growth over the years. In order to fully understand why the Fish Consumption Advisories were adopted, it is helpful to understand how the region developed to become one of the most densely populated areas in our country. Associated with this are the quality of life issues that arise from population density and lifestyle patterns.**

**KEYWORDS**

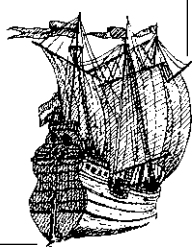
land use
landform
landform barrier
natural resource
sustainable development

**STUDENT PREREQUISITES**

Map reading
New Jersey geography

**PROCESS SKILLS**

comparing and contrasting
interpreting information
formulating hypotheses
analyzing
synthesizing
evaluating



## PLANNING

1. Make one copy of each map for every student or pair of students.
2. Make one copy of each Discovery Sheet (front and back) for every student or pair of students.

## PROCEDURE
## SETTING THE STAGE

Tell the students that they have been invited to go into New York City for a special event. Ask them to describe how they would get to the city (by car and tunnel or bridge, by bus, using the Path, by helicopter, etc.). Discuss the variety of transportation options available to the students and their families.


## THE ACTION

**Periods 1 and 2**

1. Tell the students that travel was not always as easy as it is today and that by looking at a series of maps and reading short descriptions, they will discover what it might have been like to live in the area at various times throughout history.
2. Distribute one map at a time (in order from historical to current), and have the students interpret each map by reading the time period excerpt and answering the Discovery Sheet questions.

**Period 3**

1. Ask the students to list things that enable them to live their life the way they do, then categorize these into wants and needs.
2. Discuss each category separately.
   The needs: Think about the needs of the Native Americans, the early Dutch settlers, the 1800's citizen, and your needs today. Have they changed much over time? If yes, in what way? If no, why not?
   The wants: How do you think the wants of people have changed over time? What affect could the production or distribution of wants have on the resources in the Newark Bay Complex?
3. Introduce the term "sustainable development." Have the students hypothesize what this means based on the definition of each word.
4. Lead a discussion on how wants and needs and population density relate to sustainable development.

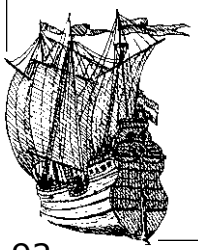


FIGURE 10A *Supplement*

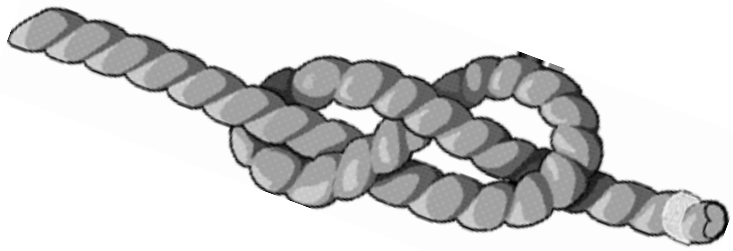
## INDIGENOUS PLACE NAMES OF NORTHEASTERN NEW JERSEY

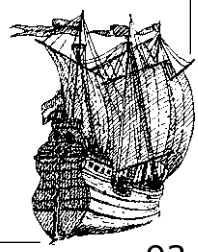
Present Day Site Names for Teacher Reference

1. Hackensack
2. Jersey City
3. River Edge
4. Watchung
5. Overpeck Creek and the Meadows
6. Hoboken
7. Manhattan
8. Moonachie
9. Part of Secaucus
10. Passaic
11. South Hackensack
12. Where the Saddle and Passaic Rivers meet
13. Secaucus
14. Teaneck
15. In Hackensack
16. Weehawken

## CLOSING DISCUSSION

1. Compare the four maps. Describe your impression of the information that is shown as you look from the oldest to the most current map. [*more towns and cities, less open space between towns and cities, more types of transportation options, changes in landforms e.g. shrinking of meadowlands, alterations in Newark Bay, etc.*]
2. Discuss what effects population growth and population density may have had on the resources of the Newark Bay Complex over time.
3. How do you think a map of 2020 will look? Justify your answer.
4. What suggestions would you have for town planners concerning future development in the area to utilize/conserve existing resources?





## ASSESSMENT STRATEGIES

Have the students:

- ❏ Select one of the wants from their list. Trace the "life" of the object from its current state back to its natural resource/s from which it came.
- ❏ List all the means of transportation and people that needed to produce that object and get the object to them.

## STAYING INVOLVED

Learn what provisions the town administrators have for restricting growth and/or encouraging growth or conserving natural resources.

Find out how town administrators work with other towns/counties to work towards regional planning.

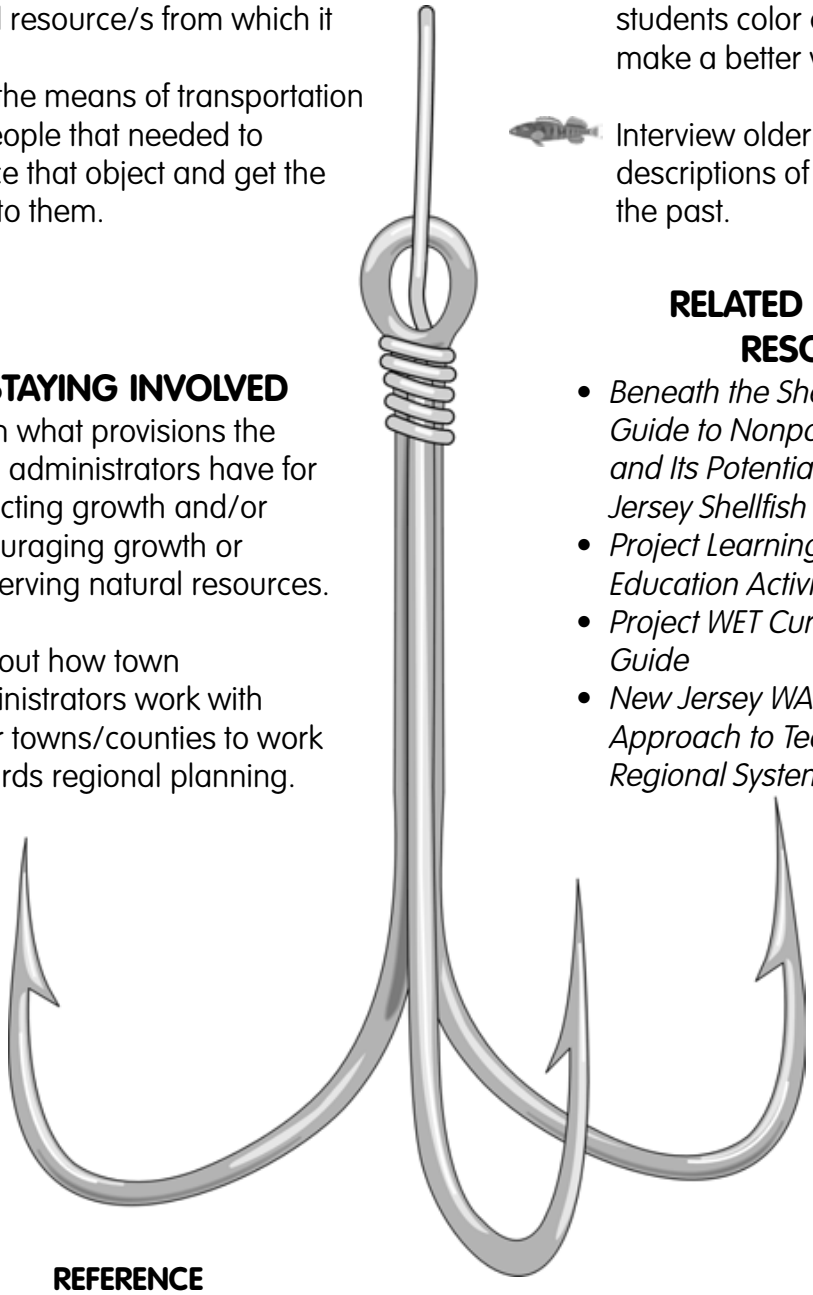
## EXTENSIONS

Trace population growth on each map by consulting census figures for the major cities and towns in the Newark Bay Complex. Have the students color code the maps to make a better visual presentation.

Interview older citizens for descriptions of the town as it was in the past.

## RELATED EDUCATION RESOURCES

- *Beneath the Shell: A Teacher's Guide to Nonpoint Source Pollution and Its Potential Impact on New Jersey Shellfish*
- *Project Learning Tree: Environmental Education Activity Guide*
- *Project WET Curriculum and Activity Guide*
- *New Jersey WATERS: Watershed Approach to Teaching the Ecology of Regional Systems*



## REFERENCE


Collins, Beryl Robichaud and Karl H. Anderson. *Plant Communities of New Jersey: A Study in Landscape Diversity.* Rutgers University Press, New Brunswick, NJ 1994.

"Indigenous Place Names in Northeastern New Jersey" by Kevin Wright. 1994. (map)

Kraft, Herbert C. *The Lenape or Delaware Indians.* Seton Hall University Museum, South Orange, NJ. 1996.

"New York From a Balloon", Harper's Weekly, Supplement, May 6, 1871. (map)

U.S. Census Bureau website: www.census.gov

For specific historic population numbers: www.census.gov/population/www/censusdata/pop-hc.html

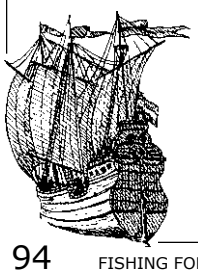
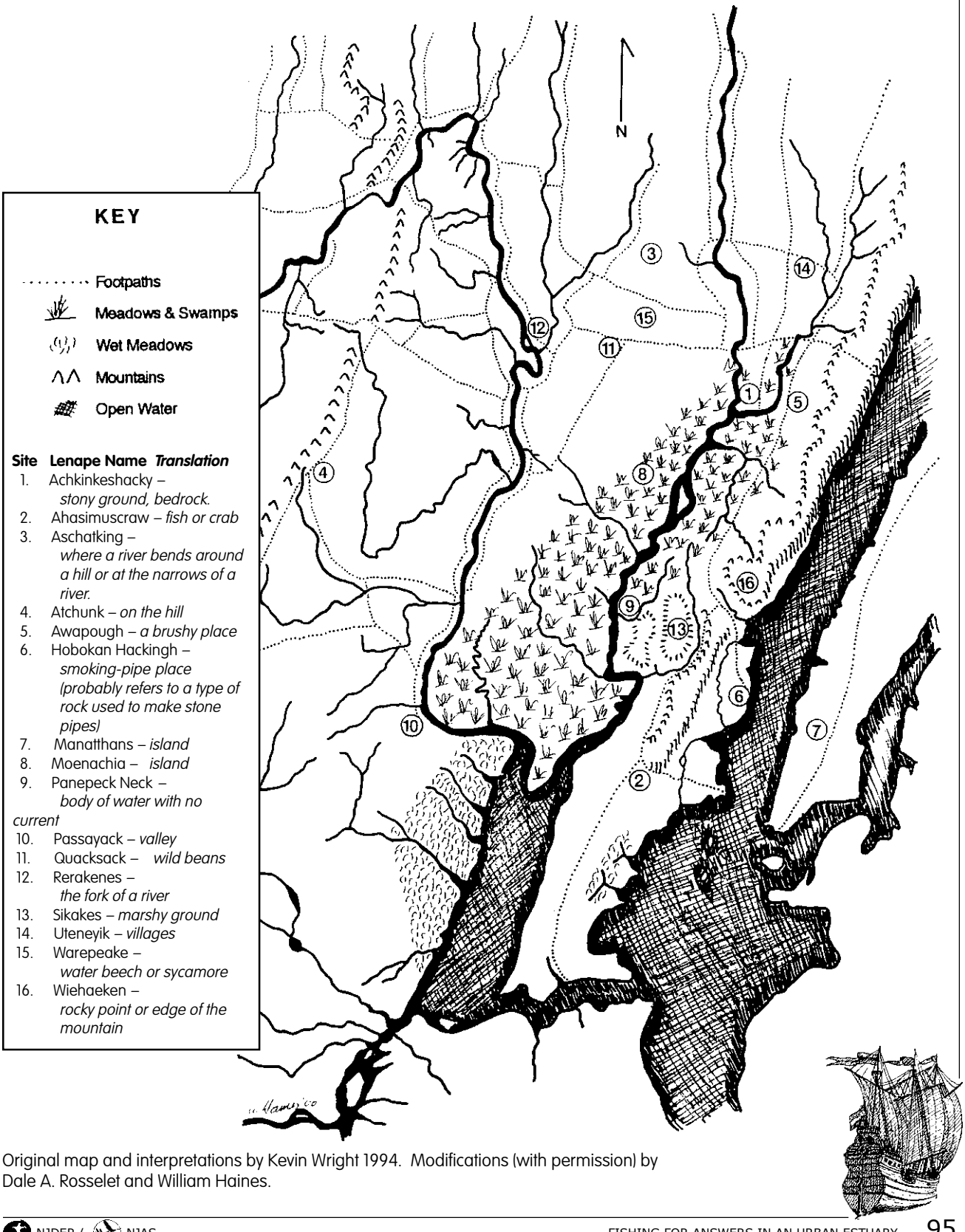



FIGURE 10A

# NATIVE AMERICANS IN THE NEWARK BAY COMPLEX BEFORE THE DUTCH SETTLERS




Original map and interpretations by Kevin Wright 1994. Modifications (with permission) by Dale A. Rosselet and William Haines.

# NATIVE AMERICANS IN THE NEWARK BAY COMPLEX BEFORE THE DUTCH SETTLERS' DESCRIPTION

Discovery Sheet #13

**THE LENAPE INDIANS**

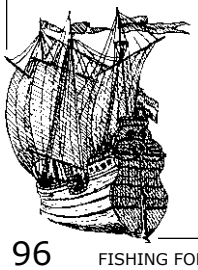
The Lenape Indians lived in small groups or bands scattered along streams and rivers. Most Lenape Indian bands had only 25 or 30 people. One or two families might live in a small wigwam, although some of the larger longhouses could house 25 or more people. The Lenape spent most of their time outdoors.

Each member of the band had his or her tasks to perform. Young girls helped their mothers and aunts gather wild plants, roots, nuts, berries, mushrooms, birds' eggs, clams and other things that were good to eat. They also worked in the garden and collected firewood. Dishes and cups were made from wood, gourds, seashells, or turtle shells and cooking pots were made from clay. Baskets were woven from reeds and roots and clothing was made from animal skins, sewn together by hand.

Men and boys cut saplings to make houses, carved dugout canoes from large trees, and cleared the forest to make fields for gardening. They also made most of the tools and weapons; hunted, fished, and trapped for food, skins and warm furs. A hunter might walk all day and not see a bird or an animal. When he was lucky enough to kill an animal, he had to carry it home on his shoulders. No part of the animal was wasted and all of the meat was eaten. The marrow and fat in the bones were cooked to make soup: the animal's skin was tanned and used for clothing, moccasins, containers, and many other items. Tools and ornaments were made from the teeth, claws, and bones; and, sinew was used as thread.

The Lenape often had to travel many days in search of food and supplies. Sometimes they would walk and the trails they used went across mountains, around lakes, and along rivers. The Lenape would carry heavy loads on their backs, for there were no horses to ride and no wagons. At times the Lenape traveled by dugout canoe that were made from tulip or cedar trees.

*Taken from The Lenape or Delaware Indians by Herbert C. Kraft. 1996.*



# NATIVE AMERICANS IN THE NEWARK BAY COMPLEX BEFORE THE DUTCH SETTLERS' MAP AND DESCRIPTION INTERPRETATION

Discovery Sheet #13

Name: _____ Date: _____

1. List six (6) places on the map that were named for landforms or habitat types.

2. List the names of places on the map that refer to a natural resource that was used by the Lenape.

3. Why do you think the Lenape named these places as they did?

4. How did the Lenape travel from one place to another?
   Why were the Native American's trails located where they were?

5. Based on your map interpretation and the story, what effect do you think the Lenape had on the land and its resources? Explain your answer.

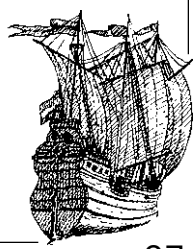
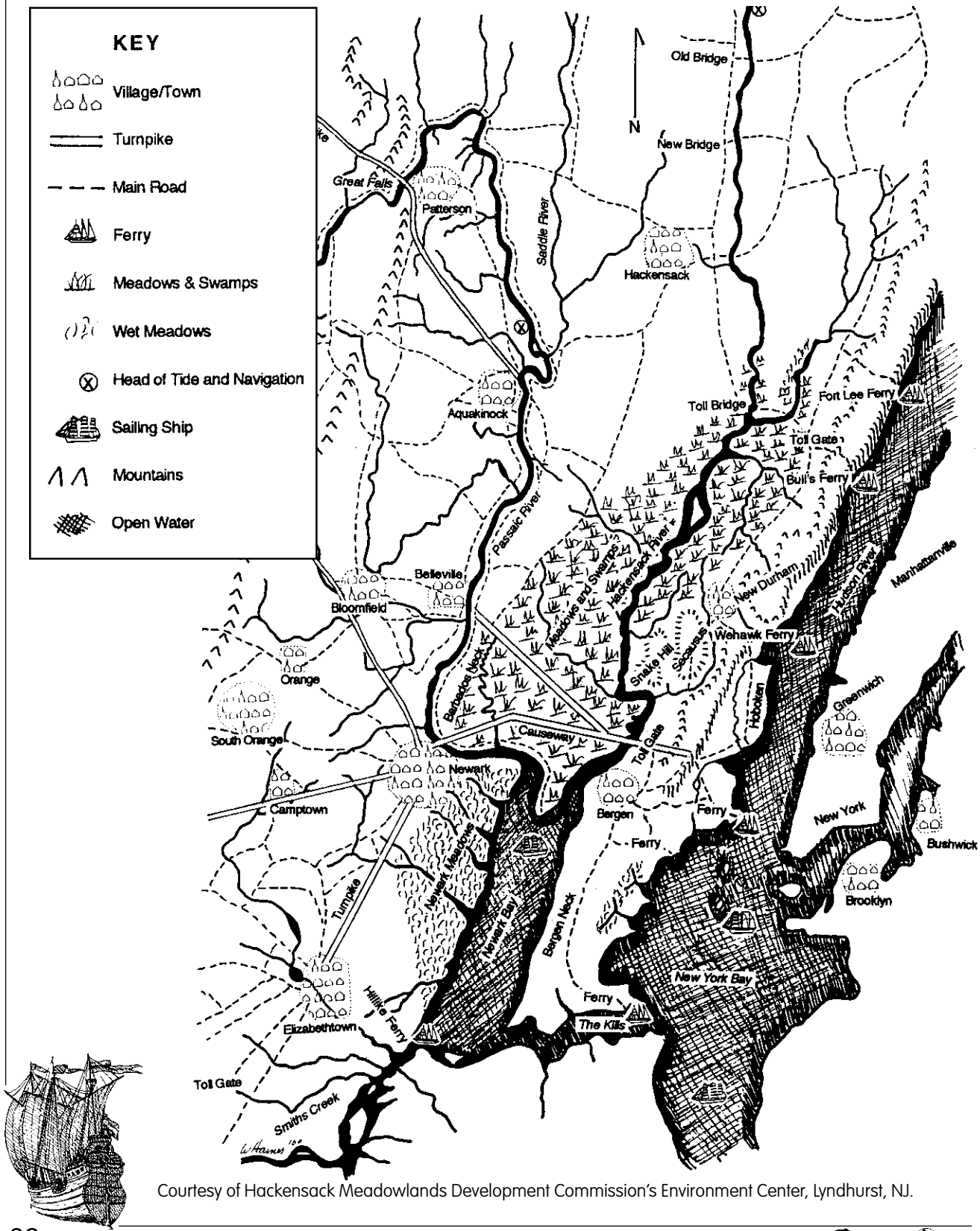


FIGURE 10B

# THE NEWARK BAY COMPLEX (CIRCA 1720)




Courtesy of Hackensack Meadowlands Development Commission's Environment Center, Lyndhurst, NJ.

# THE NEWARK BAY COMPLEX (CIRCA 1720) - DESCRIPTION

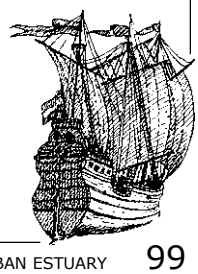
Discovery Sheet #14

**THE EARLY SETTLERS**

While most of the new settlers were farmers, there were also fishermen, craftsmen and merchants among them. Slowly people bought land in the Newark Bay Complex or were granted deeds to pieces of property by English nobility. Throughout these early times the settlers were making important discoveries about the resources their new home had to offer - a valuable copper mine was discovered in North Arlington, salt hay that grew in the salt marshes of the Meadowlands could be harvested to feed livestock, and cedar trees that dotted the marsh could be harvested to manufacture into a variety of products. The red/brown clay found in the Hackensack Valley was easily baked to create earthenware pottery and later became a primary source for brick making. The first substantial houses built by European settlers were made from wood, with brick chimneys that were molded and baked at their building site.

These early settlers needed to be fairly self-sufficient. Although a man's main occupation might have been building houses, he might also have had to raise crops, raise livestock, and make other products (like chairs and other furniture) to trade for some of his family's necessities. The other members of the family also had important roles in maintaining the household. The woman of the house would process and preserve food for the winter, spin yarn to make cloth and clothing, care for barnyard livestock, and school the children. Children also had chores. Young girls would help their mother with all of her jobs: as well as tend the garden and learn to sew. A boy would help with the chores around the house, as well as learn farming and other skills from his father.

Rivers remained the principal arteries of commerce and travel. Boats and sloops sailed up and down the Hackensack River going to and from New York and other regions. These boats carried wood, lumber and agricultural products. A primitive network of dirt roads followed the contours of the upland above the Passaic River and the Meadowlands. Ferries crossed the Hackensack and Passaic Rivers and short causeways across marshy areas were built of cedar trunks, lying side by side. These corduroy or plank roads helped accommodate travelers, carriages, horses and cattle moving from the country of New Jersey to the markets of New York.



# THE NEWARK BAY COMPLEX
# (CIRCA 1720)
# MAP and DESCRIPTION INTERPRETATION

## Discovery Sheet #14

Name: _____ Date: _____

1. List the towns and cities whose names you recognize.

2. Why were these towns located where they were?

3. What types of transportation do you think were the most common during this time period?

4. Why did these early settlers use these types of transportation?

5. Compare this map to Map 1. What are some similarities and differences between the maps?

6. What were some of the barriers to transportation that the early settlers had to overcome to transport themselves and their goods?

7. How can you tell from the map that population increased?

8. What role does transportation have in increasing population in a specific area?

9. What were some of the effects that this growth had on natural resources?

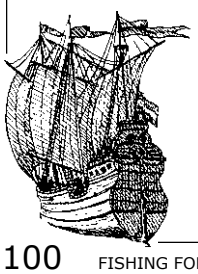
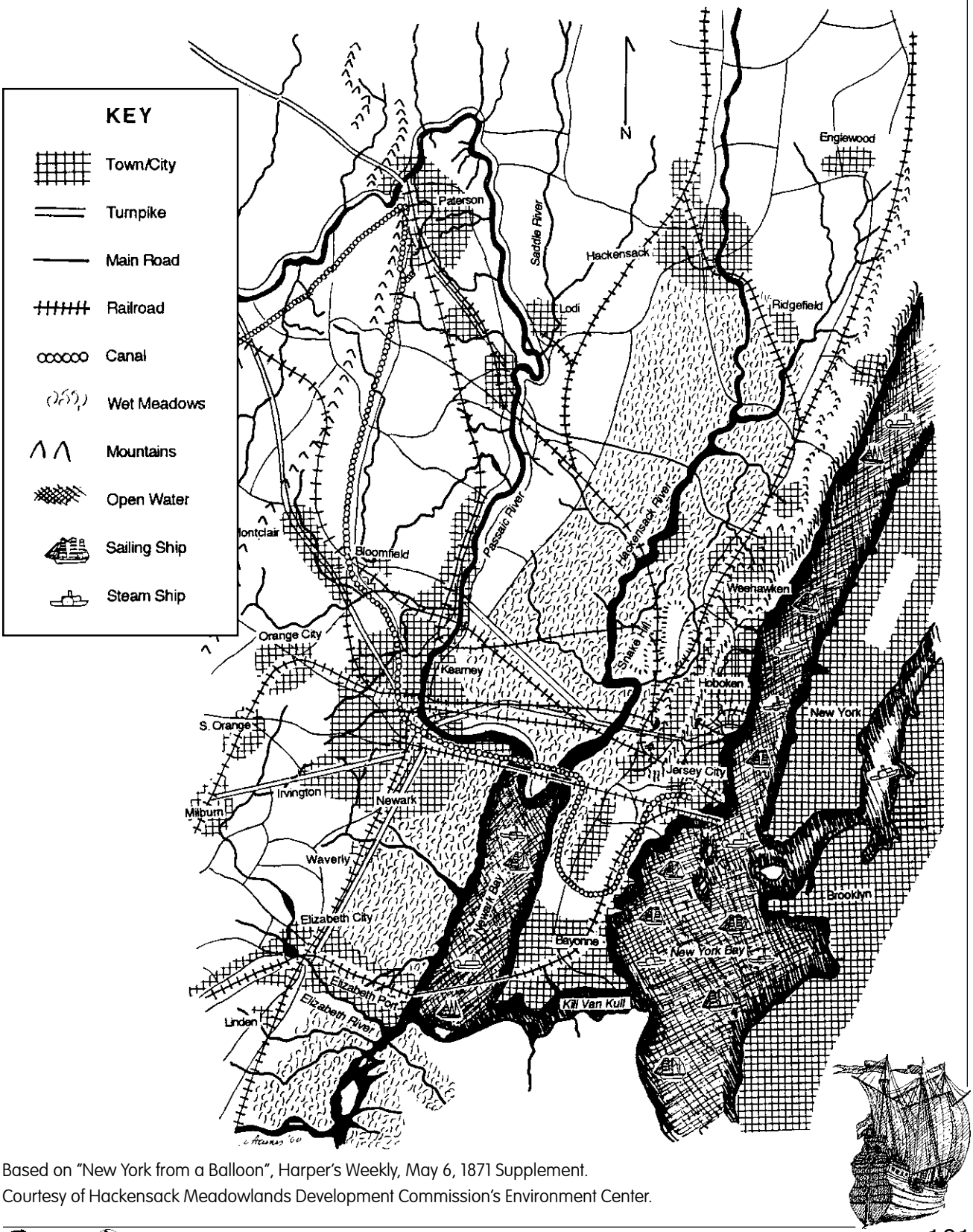


FIGURE 10C

# THE NEWARK BAY COMPLEX (CIRCA 1871)



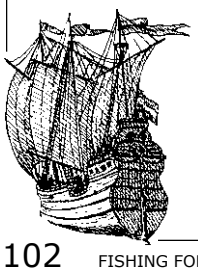

Based on "New York from a Balloon", Harper's Weekly, May 6, 1871 Supplement.
Courtesy of Hackensack Meadowlands Development Commission's Environment Center.

# THE NEWARK BAY COMPLEX (CIRCA 1871) - DESCRIPTION

## Discovery Sheet #15

Immigration into the country increased dramatically during the late 1800's and early 1900's. New York City and many of the larger cities in New Jersey (Newark and Elizabeth) became thriving metropolises. The political and economic upheaval of the American Revolution disrupted the primitive transportation system and throughout the 1800's vital improvements were made to this system. There was a great push for more permanent roads, causeways, and bridges. According to reports, the causeways across the marshes consisted of three or four layers of logs covered with earth and surfaced with gravel. Clearly, it was important to have reliable transportation to make it easier for merchants to bring their wares to New York City.

During this time river craft increased in size and schooners carrying brick and agricultural products became a common sight. Vessels and steam-tugs ran up the Hackensack and Passaic Rivers with coal, lumber and other freight. Trading, purchasing, and transporting goods were essential to the economy. The marshes remained a vast uninhabitable field of salt grasses and cedar thickets, wedged between the industrial cities and farmlands to the west and the great city of New York to the east. Every day businessmen described different plans for aiding in transportation of goods and people. The Morris Canal was dug, but soon it was made obsolete by the invention of the steam engine and the building of the railroads. Throughout this time the scull-boat was used extensively for hunting waterfowl and for trapping. Anglers also used it to catch fish and eels.



# THE NEWARK BAY COMPLEX
# (CIRCA 1871)
# MAP and DESCRIPTION INTERPRETATION

Discovery Sheet #15

Name: _____ Date: _____

1. What are the similarities and differences between this map and the two previous maps?

2. What types of transportation were common during this time?

3. What new methods of transportation can you discover by studying this map?

4. How were some of the barriers to transportation solved by 1871?

5. Compare this map to Map 2. Name a town or city that you find on both maps. By looking at the two maps, explain how the town or city has changed or remained the same.

6. How can you tell that the population of the area has increased between the time periods that are shown on Map 2 and Map 3?

7. What were some of the effects that this growth had on natural resources?

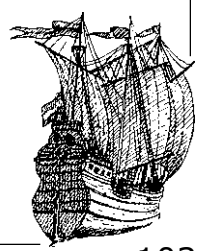
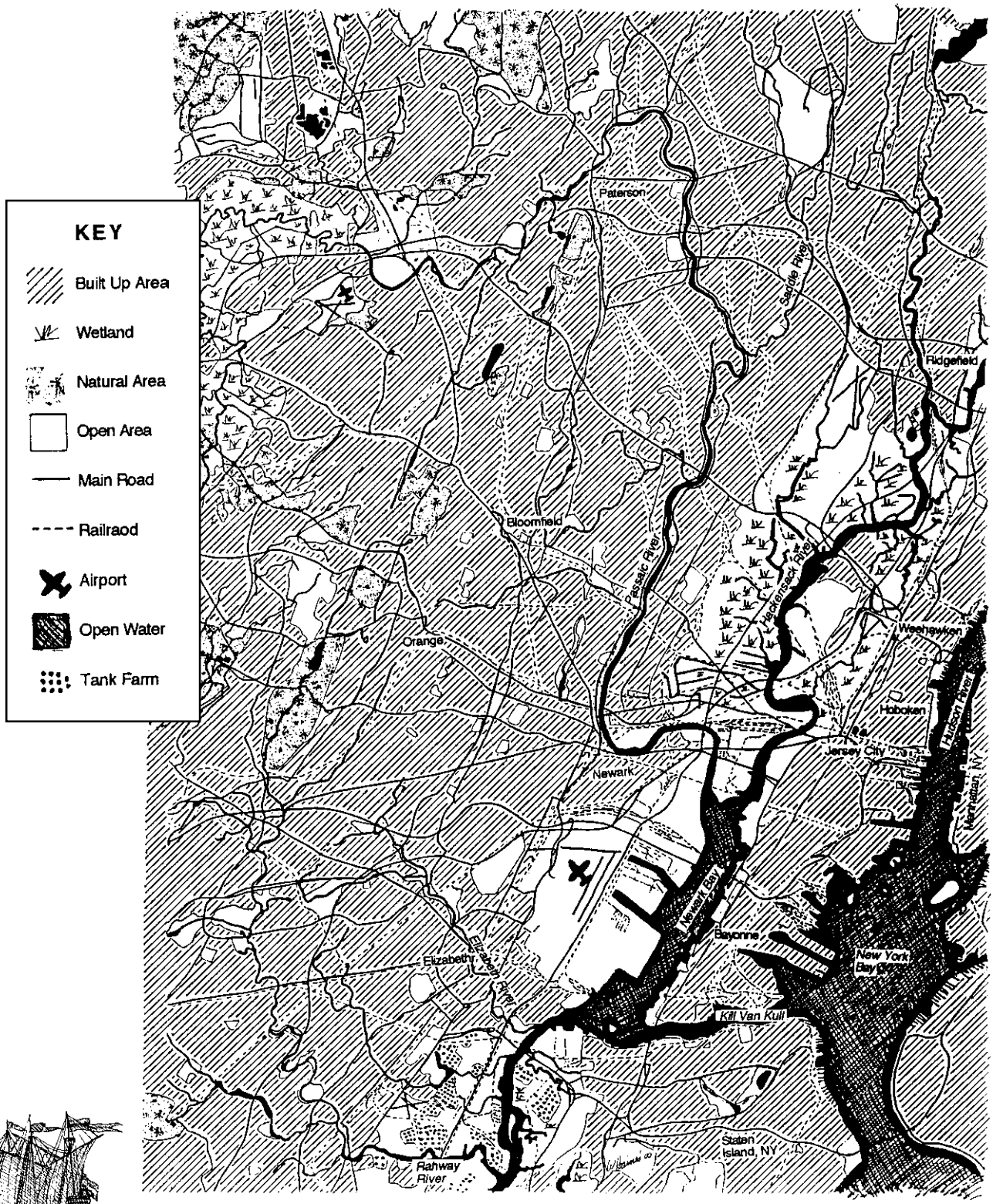


FIGURE 10D

# THE NEWARK BAY COMPLEX, TODAY




Reprinted in part from U.S. Geological Survey and the National Ocean Service, Newark, New Jersey - New York quadrangle:1:100 000-scale topographic-bathymetric map. 1986.

# THE NEWARK BAY COMPLEX, TODAY
# MAP INTERPRETATION

## Discovery Sheet #16

Name: _____ Date: _____

1. What new methods of transportation do you see on this map of the Newark Bay Complex compared to 1871?

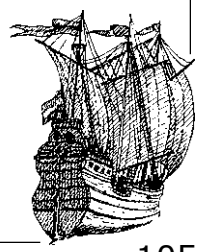
2. How is this map similar to the other three maps? How is it different?

3. How has current technology dealt with landform barriers to transportation?

4. What places have been population centers since the time of the early settlers?

5. How do you think population growth affected the natural resources of the area?

6. How would you find out what type of "open space" is represented on the map?



# NOTES